

San Francisco Law Library

No. 76652

Presented by

EXTRACT FROM BY-LAWS

Section 9. No book shall, at any time, be taken from the Library Room to any other place than to some court room of a Court of Record, State or Federal, in the City of San Francisco, or to the Chambers of a Judge of such Court of Record, and then only upon the accountable receipt of some person entitled to the use of the Library. Every such book so taken from the Library, shall be returned on the same day, and in default of such return the party taking the same shall be suspended from all use and privileges of the Library until the return of the book or full compensation is made therefor to the satisfaction of the Trustees.

Sec. 11. No books shall have the leaves folded down, or be marked, dog-eared, or otherwise soiled, defaced or injured. Any party violating this provision, shall be liable to pay a sum not exceeding the value of the book, or to replace the volume by a new one, at the discretion of the Trustees or Executive Committee, and shall be liable to be suspended from all use of the Library till any order of the Trustees or Executive Committee in the premises shall be fully complied with to the satisfaction of such Trustees or Executive Committee.

1102 ✓
No. 2996

United States
1 1102
Circuit Court of Appeals

For the Ninth Circuit.

Transcript of Record.

(IN THREE VOLUMES.)

WILSON & WILLARD MANUFACTURING
COMPANY, a Corporation,

Appellant,

vs.

UNION TOOL COMPANY, a Corporation, ED-
WARD DOUBLE, ROSA EICHENHOFER,
as Administratrix of the Estate of FRIED-
RICH EICHENHOFER, Deceased, and
GEORGE L. CHADDERDON,

Appellees.

VOLUME II.

(Pages 321 to 736, Inclusive.)

Upon Appeal from the United States District Court
for the Southern District of California,

Southern Division.

Filed

MAY 16 1917

United States
Circuit Court of Appeals

For the Ninth Circuit.

Transcript of Record.
(IN THREE VOLUMES.)

**WILSON & WILLARD MANUFACTURING
COMPANY, a Corporation,**

Appellant,

vs.

**UNION TOOL COMPANY, a Corporation, ED-
WARD DOUBLE, ROSA EICHENHOFER,
as Administratrix of the Estate of FRIED-
RICH EICHENHOFER, Deceased, and
GEORGE L. CHADDERDON,**

Appellees.

VOLUME II.
(Pages 321 to 736, Inclusive.)

**Upon Appeal from the United States District Court
for the Southern District of California,
Southern Division.**

(Testimony of Edward North.)

Redirect Examination.

(By Mr. BLAKESLEE.)

Q. 143. What, if anything, was said during the period including the negotiations which culminated in 1904 contracts with respect to competing with underreamers then in the field?

A. I can't remember exactly. I know Mr. Double encouraged me that we would be able to compete, in fact, the contract there specifies on his part that he will push the sale not only in California but in the eastern states and other parts of the United [269] States.

Q. 144. As to this \$50 royalty on the North reamer which was to be paid by the Union Oil Tool Company, please state again how that was to be apportioned as to yourself and Mr. Double?

A. The contract speaks for itself. It was half and half. He was to have half and I half.

Q. 145. When was it you tried to get Mr. Double's interest in the North patent back from him?

Mr. LYON.—Objected to as irrelevant and immaterial.

A. I tried to get him to name a figure on it in 1905 or '6, I have forgotten now which.

Q. 146. (By Mr. BLAKESLEE.) What did Mr. Double tell you when you made this attempt to get it back?

Mr. LYON.—Objected to unless the time and place of the alleged conversation is more definitely fixed.

A. He said he did not care to sell.

(Testimony of Edward North.)

Q. 147. (By Mr. BLAKESLEE.) Anything further? A. I don't remember that there was.

Q. 148. Are you able to locate the time of this conversation more definitely? A. No.

Q. 149. And as to the place, where was it?

A. Here in Los Angeles.

Q. 150. Can you state any more definitely than that? A. It was a telephone conversation.

Q. 151. Do you remember where you were?

A. I think I was in the H. W. Hellman building. By the way, that enables me to fasten it a little. It was in 1906.

Q. 152. Are you able now to state any more definitely what time of the year? A. No.

Q. 153. Did you make any proposition to Mr. Double in that telephone conversation as to what you would do in this connection? [270]

Mr. LYON.—Objected to as being incompetent, calling for the conclusion of the witness, not for a statement of the conversation, and therefore incompetent.

A. No.

Q. 154. (By Mr. BLAKESLEE.) Have you anything further to say with relation to the Jones 1906 patent, any invention disclosed therein, as to its relation with the arrangement and agreements you entered into with Mr. Double and his company?

A. The agreement between Mr. Double and myself for him to manufacture the—or the Union Tool Oil Company—to manufacture reamers was made without any reference to the Jones reamer whatsoever.

**Testimony of W. W. Wilson, for Defendant
(Recalled).**

A. 344. This O'Donnell & Willard patent covers an underreamer consisting of a solid body having means of attachment to suitable tools at the top, and having a tapering hole bored centrally in the lower end of the body for a distance, above which there is a straight hole for the reception of a spring and T-rod. In the upper end of the tapered hole there is a threaded portion into which a wedge-shaped piece shown at 3 in the drawing, which wedge-shaped piece is provided at its top with a threaded portion and may be made to engage with the threaded portions of the body. The wedge-shaped portion 3 has drilled through its upper portion a hole 6 for the passage of the mandrel rod, and below this hole is a slot 4 to allow movement of the laterally-extending lugs of the lower end of the T-rod, said slot being long enough to allow sufficient play to the T-rod to give proper action to the cutters. On the lugs of the T-rod, fastened thereto by slots threading over these lugs, are two cutters, 12 and 12'. These cutters have shanks which are arranged to fill the cavity on each side of the wedge, portion 4, when the cutters are in expanded position. Below these [271] shanks of the cutters are bodies terminating at their lower ends in outwardly projecting cutting faces. The upper portion of the mandrel rod has around it a spring, which spring bears on its lower end on the threaded plug, on the upward end of the partition 4, and the spring at its upper end bearing against threaded

(Testimony of W. W. Wilson.)

nuts which are screwed on the threaded portions of the top end of the mandrel rod. This spring being in compression, tends to draw the cutters to expanded position. The collapsing of the cutters is caused by their sliding downward over the wedge-shaped piece 3 which allows the lower ends of the cutters to come together. Also, the upper ends of the cutters ride outwardly, bearing against the outer walls of the tapered pockets, allowing them to tilt outwardly, causing the further contraction of the cutters, due to the tilting over the fulcrum, over the lower end of the wedge-partition 3. To maintain the wedge-shaped portion 3 in position when the tool is being used, there are plugs 28 which pass through holes in the side of the body and are threaded into the wedge-shaped portion 3, preventing it from unscrewing out of the body. The reamer is also provided with a locking device for locking the cutters into reaming position when below the casing. This locking device consists of a plug 21 which slides sideways in the hole in the wedge-shaped portion 3 and extends outward through the body through suitable holes. This plug has behind it another plug which has a tapered face 17, which may pass underneath the lower end of the T-rod. Behind this plug 16 there is a spring which bears against it, at one end, and on the other end bears against a threaded button 19, to hold it in place. When the reamer is run in the casing the plug 21 is pressed inwardly, causing plug 16 to be thrown back in such position that the beveled face of 23 on the mandrel rod engages the bevel face

(Testimony of W. W. Wilson.)

17 on the inner plug 16, so that the mandrel rod may be drawn down by means of the cutters, forcing the plug 16 back, compressing the spring 20, allowing the [272] cutters to be withdrawn and collapsed. When the reamer is run in the hole the sides of the bodies of the cutters bearing against the casing hold them in collapsed position until the cutter passes the shoe, when this pressure is released, allowing the spring to draw the cutters up into the working position. This movement of the mandrel rod upward, frees plug 16, allowing it to press against the plug 21. When the reamer is further lowered allowing the plug 21 to move past the shoe, it is forced outward against the shoulder 25 allowing the plug 16 to move still further in, so that there is a plane surface bearing against the bottom of the mandrel rod holding it in that position. Thus the cutters are locked and cannot be withdrawn or displaced when beyond the casing. When the reamer is withdrawn from the casing the plug 21 first strike the shoe, causing it to move inwardly, which causes the plug 16 to move to such position that the shoulder 17 may be engaged by the mandrel rod. On further withdrawing the reamer from the casing the casing shoe strikes the shoulders on the cutters causing them to be drawn downward, the tapered shoulder 23 on the lower end of the mandrel rod striking the beveled face 17 on the plug 16 and causes it to be thrown further over against the compression of the spring, allowing the cutters to be drawn downward into col-

(Testimony of W. W. Wilson.)

lapsed position when the reamer may be withdrawn from the casing.

Q. 347. Will you please compare this model with the "Defendant's Exhibit O'Donnell and Willard Patent"?

A. The model is a disclosure of the O'Donnell and Willard patent with the exception that the pins 28 for retaining the wedge-shaped partition in place are not shown in the brass model. Also, the locking means consisting of plug 19, spring 20, plug 16 and plug 21, shown in the patent drawing, are not present in the brass model.

Q. 348. Please state where you got this brass model.

A. This model was made at the Wilson & Willard Manufacturing Company in compliance with the disclosure of the patent about the [273] time that I was first employed at the Wilson & Willard Manufacturing Company.

Q. 349. Please state what you know personally as to its manufacture.

A. I handled the orders on the books at the time it was made at the Wilson & Willard Manufacturing Company and saw it in construction at that time.

Mr. BLAKESLEE.—The small brass model just discussed is offered in evidence as "Defendant's Exhibit Partial O'Donnell and Willard Underreamer on Diminutive Scale."

Mr. LYON.—Objected to as incompetent and as fragmentary and as not embodying either the construction or mode of operation of the disclosure of

(Testimony of W. W. Wilson.)

the O'Donnell and Willard patent, and as misleading.

Q. 350. (By Mr. BLAKESLEE.) Have you examined "Defendant's Exhibit O'Donnell and Willard Underreamer?" A. I have.

Q. 351. Please compare the same with the disclosure of "Defendant's Exhibit O'Donnell and Willard Patent."

A. The "Defendant's Exhibit O'Donnell and Willard Underreamer" differs from the disclosure of the O'Donnell and Willard Underreamer patent in that there are no locking means as shown by plug 19, spring 20, plugs 16 and 25, present in the O'Donnell and Willard underreamer. The O'Donnell and Willard underreamer exhibited also differs from the patent in that there is placed on the upper portion of the body a ring, which ring has in its upper portion a key which passes through a slot in the body over the top of the T-rod and at 90 degrees around the circumference of this ring there are casing engaging means which extend outward to a greater diameter than the inside of the casing when the reamer is in expanded position. In the body underneath these casing engaging means are suitable slots so arranged that when the engaging means are drawn downward sufficient [274] to compress the spring they may move inward to a contracted position in the reamer body, their outside diameter then being equal to or less than the inside of the casing. This device is used for the purpose of holding the spring in compressed position, and, therefore, reduces its upward pressure on the cutters when the reamer is

(Testimony of W. W. Wilson.)

being run into or out of the casing.

Q. 356. (By Mr. BLAKESLEE.) Please compare the operation of the reamer disclosed in "Complainants' Exhibit Double Patent" with the operation of the reamer disclosed in "Defendant's Exhibit O'Donnell and Willard Patent," eliminating from consideration the features of "Defendant's Exhibit O'Donnell and Willard Patent" which are lacking in "Defendant's Exhibit O'Donnell and Willard Reamer," upon encountering sticky formations or other unusual formations, such as you have referred to.

A. In each reamer there is a body with means for attachment to the tools at the upper end, each having a central bore for the placement of spring and mandrel rod, such spring on the upper end bearing against the end threaded on the upper end of the mandrel rod, and on its lower end in the Double underreamer disclosed against a shoulder in the underreamer body, and in the O'Donnell and Willard underreamer against a shoulder on the upper end of the threaded plug on the top of the central partition. The mandrel rod in the Double underreamer at its lower end has a slot for the reception of a key, which key extends downward through a slot in the body into contact with the upper edges of the slots in the shanks of the cutters. In the O'Donnell and Willard patent the lower end of the mandrel rod is integral, forming a T-rod, with lugs extending outward in contact with the upper edges of the slots in the cutters. The cutters in both cases are separated

(Testimony of W. W. Wilson.)

completely to an expanded position by a partition between them, which partition has a hole for the passage of the mandrel rod and a slot for the movement and directing of the key on the Double underreamer, and the lugs on the lower end of the T-rod in the O'Donnell and Willard underreamer. This partition remains partly between the cutters when in contracted position in both the Double underreamer and [275] in the O'Donnell and Willard underreamer. The contraction of the cutters is caused in both cases by the movement downward over the end partition, allowing the removal of the partition to allow the cutters to collapse together at their lower ends, and also by the movement outward of the shanks of the cutters in the O'Donnell and Willard underreamer bearing against the downwardly outwardly tapering faces of the pockets in which the cutters move, and in the Double underreamer caused by the upper ends of the dovetail of the cutters riding outwardly on the outwardly downwardly tapering of the dovetail shoulders on the body. The tilting of the cutters in both cases being complex, the movement of the slots in the shanks of the cutters being partly tilting and partly sliding in their movement to contracted or expanded position in both reamers. The outwardly downwardly tapering faces on the cutter pockets in the O'Donnell and Willard underreamer, and also the outwardly downwardly tapering dovetail shoulders in the Double underreamer, are placed as they are to allow the spreading of the upper ends of the cutter shanks, which causes

(Testimony of W. W. Wilson.)

collapsing of the cutting points because of riding over a sliding fulcrum near the center of the cutter lengths. The operation of the reamers in running in a hole, expanding and withdrawing, is the same in both reamers.

With the collar of the O'Donnell & Willard underreamer omitted, the action of the cutters when running down the casing or when striking against the casing shoe at the bottom when collapsing and drawing down over the spreading bearing is the same. The action of the cutters when in operation would be the same in most cases, and the cutters would tend to stick in the hole, and the cutters would probably stick due to the suction until the upward removal of the wall or partition from the cutters which would allow the cutters to collapse until they would be released from the suction.

The Wilson underreamer as disclosed by the Wilson underreamer [276] patent consists of a body having a hole drilled from the bottom for the reception of a spring and key-rod. A block acting as a seat for the spring, the spring being confined on the key-rod by a nut, the block being held in place, detachably, by means of screws or dowel pins. The underreamer is equipped with two cutters which are spring actuated, and are mounted between two prongs which constitute the lower end of the reamer body. These prongs have on their inner faces ridges 3 and on the lower end of the prongs are spreading faces 9 and 17. The cutters have ridges or dovetail shoulders on their sides 4² which engage the ridge 3

(Testimony of W. W. Wilson.)

on the inner faces of the prongs. The cutters have pockets for the reception of lugs on the T-rod on which lugs the cutters are suspended. The collapsing of the cutters is caused by their downward movement against the pull of the spring and the T-rod. This downward movement allows the cutters to pass down, over and beyond the faces 9 on the prongs, and to slide inward with the upper edges of the faces 4³ bearing against the spreading faces of 17. The expansion of the cutters is produced by the pressure of the spring which draws in the cutters upwardly and over the spreading bearings on the ends of the prongs of the reamer body.

Testimony of William Plotts, for Defendant.

Mr. Plotts testifies as follows:

My name is William Plotts; my former occupation was well driller. I am retired now. Age, 56. Resident of Whittier. I commenced in the oil business about 38 years ago. My first experience was in Pennsylvania. Have operated in the different fields of California. Last experience was in Whittier. I am familiar with underreamers among which was the Snow underreamer and the next was the Austrian. The first Austrian I used was in Santa Paula in 1897. The Austrian was unsatisfactory on account [277] OF BEING WEAK IN THE PIVOT. It was so unsatisfactory that I decided to improve it. I designed an underreamer myself covered by underreamer patent No. 668,340, issued February 19th, 1901. Have used the Plotts under-

(Testimony of William Plotts.)

reamer ever since up to some three years ago when I quit active work in the oil business. I was connected with the Murphy Oil Company and we usually run about four sets of tools. Have reamed about 35 wells with the Plotts underreamer, possibly 40. It gave us good results. Better results than we have got from any other kind. My company, in which I was interested, after I quit active work, got some underreamers known as the "Double" underreamers; but they did not find them satisfactory. They used Double underreamers and Plotts underreamers at the same time they made this test of the Double reamer. I believe it is generally conceded the Double reamer is faster, if there is no tendency to get a crooked hole.

Q. 114. You say that the Murphey Oil Company drillers found it necessary to go back to the Plotts reamers. Have you personal knowledge of this matter? A. No. It is only my information.

Mr. LYON.—We move to strike from the record and exclude from consideration all that testimony of the witness which deals with the matter last inquired about, as hearsay; not the best evidence.

A. My information is also more than just merely being informed, because they are now using the Plotts underreamer, when they discarded it temporarily for the Double some three years ago.

The Plotts underreamer has been used in various oil fields in California, and they were also shipped to the West Virginia fields.

The Plotts underreamers were made by B. D.

(Testimony of William Plotts.)

Tillinghast, of McDonald, Pennsylvania. The Plotts underreamers were changed slightly from that disclosed in the patent, by placing the spring above the cutter and back of the pivot. That is about the only difference. [278]

Cross-examination.

I came to California in 1897 and went to Santa Paula that year. I drilled for the Union Oil Company at Santa Paula.

The weakness of the Austrian underreamer was the pivot pin, or the pin to which the cutters were attached, which would bend and prevent the cutters from expanding. The Austrian underreamer was not satisfactory on that account.

I made a contract with Mr. Tillinghast in 1897 and he has continued the manufacture of the Plotts underreamer from that time until the present time. He made them on a royalty basis. I was superintendent of the Murphey Oil Company for 11 years. I am vice-president of that company to-day. In speaking of breaking of cutters in Plotts reamers there were certainly not more than a half dozen broken in all the course of the use of that tool on the Murphey property. They are now using Plotts underreamers after having found the Double unsatisfactory. The Plotts is so designed that we run a standard-drilling bit below it. The Plotts underreamer is used with the drilling bit at the end of the string of tools, the drilling bit is under the reamer. It could be used without carrying the main drilling bit at the end but it would not be so satisfactory.

(Testimony of William Plotts.)

ordinarily, the bit steadies it up in the hole and causes it to make the hole straight, preventing it from flopping around sideways. I have lost strings of tools in the hole mainly due to broken pins. Any tools that diminishes breakage or the occurrences of breakage in drilling wells is an advantage.

Testimony of Albert Schinneller, for Defendant.

Testifies as follows: My name is Albert Schinneller, residence, Whittier; occupation, Driller and Superintendent of the Murphey Oil Company. I have been with the Murphey Oil Company thirteen years. I am acquainted [279] with Mr. William Plotts. I have been tool dresser, driller and a little of everything during the time I have been with the Murphey Oil Company, but I am now superintendent. Before that time I was a driller in Pennsylvania. I am acquainted with the use of underreamers. The first reamer I used was the Plotts reamer. That was in the Whittier fields, that reamer was designed by Mr. Plotts. To run the reamer into the hole the cutters are doubled down, and it opens up when it comes out at the lower end of the casing. You then hitch on to the line and drill or ream with it the same as when drilling with standard tools.

We have also used Double underreamers on the Murphy Oil property. 4,700 feet is the deepest well we are drilling on it now, using the Plotts reamer. We encountered shells all the way from a few inches to I guess a hundred feet in thickness. We have reamed hard places for a hundred feet thick.

(Testimony of Albert Schinneller.)

Q. 18. I now show you "Defendant's Exhibit Plotts Patent No. 668,340," and ask you to examine the drawing of the same and tell us if what you see there relates in any manner to the Plotts underreamer to which you have referred.

Mr. LYON.—Objected to as leading, and as incompetent, the witness not having qualified to answer the question; and upon the further ground that it is apparent that it is intended to educate the witness for his further testimony in this case, and highly improper proceeding; and on the further ground that it is incompetent and not the best evidence and no foundation laid for the introduction of secondary evidence.

A. No.

Mr. BLAKESLEE.—Well, if counsel does not like this method of procedure, we will get at it in another way.

Q. 19. Please give us a statement of the general construction and organization of the parts of this Plotts reamer to which you have referred. [280]

A. That is the body of it, and the cutter, mandrel, spring and the sub.

About four years ago we started to use Double reamers. They are still using the Double reamer and the Plotts reamer too. We have never quit using the Plotts underreamer as we are still using it. Up to four years ago we used none but the Plotts reamer; at that time we got one Double reamer. I think we have had six Double reamers altogether. We run three wells, used three Plotts reamers and

(Testimony of Albert Schinneller.)

one Double reamer. Generally run about four strings of tools. We had good success with the Double all but one hole, which hole went crooked and broke the cutters off. We then changed from the Double reamer to the Plotts reamer and carried the hole about 200 feet.

The Double underreamer was broke right through the eye that holds the cutters. Lost the lower part of the cutters in the hole. We had to drill up the broken Double cutters in the hole. I like the Plotts reamer, especially on small holes, for the reason that the Plotts reamer is a little stronger, not so liable to lose the cutters, or break the cutters off. Furthermore, if the cutters should be broken off it is smaller and there is less trouble to drill them up. Never had any trouble to get the Plotts underreamer out of the hole. I have had some trouble in doing so with the Double. We broke the body of a $5\frac{5}{8}$ inch Double underreamer. The use of a drilling bit in connection with the Plotts underreamer is merely to be used as a guide. After breaking the bit off of the Double underreamer in the crooked hole, we again attempted to run the Double reamer with the new style cutters or bits, we broke a cutter and it broke the reamer too. It broke out the side of the reamer and we could not run it any longer. The reamer was practically a new one.

The hole in which we broke the Double underreamer was the first hole crooked enough to give us any trouble. [281]

The Plotts underreamer cutters up to $9\frac{5}{8}$ are 3

(Testimony of Albert Schinneller.)

inches wide. The $4\frac{1}{2}$ inch has cutters $1\frac{1}{2}$ inches wide. I ordered the first Double underreamer at $6\frac{5}{8}$ inch because we were running casing at that time with very thin shoes on. I think you can ream faster if you have a good hole when running the Double reamer, than you can with the Plotts. The reason for this increased speed with the Double reamer is because they have wider cutters. If they did not have wide cutters I think there would not be much difference between the speed of the Double and the Plotts. In bad holes I believe I prefer the Plotts reamer to the Double.

Have broken the cutters off the Plotts reamer. That was due to large shells; hit too hard; rough usage, may be. We frequently break drilling apparatus of all kinds. We use a "sub" with the Plotts reamer. Never had any trouble with any of the joints unscrewing. More or less every hole in those sliding shells in those hills is crooked. (Shown the cuts of the Austrian reamer in the Oil Well Supply Company's catalogue in evidence, witness identifies this as the Plotts reamer, saying: "They look practically the same to me. There may be a little difference in them.")

My reason for ordering the first Double reamer was we were running some light casing with very thin shoes. We had punched several of the other shoes reaming with the Plotts reamer. If you have a good hole you can ream faster with the Double reamer than with the Plotts. I think it takes about a third of the time to ream with the Double in a good

(Testimony of Albert Schinneller.)

hole that it does with the Plotts; it depends some on the formation. Since we bought the Double reamers we have not used the Plotts reamers with the thin shoes. In regard to thin shoes,—well, we want to keep the hole as large as we can, and therefore we want to get as heavy a pipe or as large a pipe down the hole; say like, for instance, $7\frac{5}{8}$ hole we are drilling, and we want to keep the hole large so we could use $6\frac{5}{8}$ pipe inside of that; that would require a thin shoe on that to go through the $7\frac{5}{8}$ and thin collars on that. In oil well [282] drilling it requires the use of thin shoes and thin collars. The Murphy is the only company I know of ever using the thin shoes and collars. I have had no experience in California outside of the Murphy property. When we broke the Double reamer the hole was crooked and the Double reamer goes to straighten the hole, and it was practically solid, solid formation there, what broke it practically drilling a new hole, might say; starting to drill a hole. [283]

**Direct Testimony of W. W. Wilson, for Defendant
(Resumed).**

(By Mr. BLAKESLEE.)

Q. 360. Please compare the disclosure of “Defendant’s Exhibit Wilson Patent” with the construction and Inter-relations of parts embodied in each of “Complainants’ Exhibits Double Underreamer and Wilson Underreamer” and “Defendant’s Exhibit Double Underreamer,” and “Complainants’ Exhibit Wilson Underreamer Number 2.”

A. The Wilson underreamer as disclosed in the

(Testimony of W. W. Wilson.)

Wilson patent is the same as the underreamer shown in "Complainants' Exhibit Wilson Underreamer" and "Complainants' Exhibit Wilson Underreamer Number 2," excepting as follows: The means of holding the lower end of the spring consisting of blocks 7 and pins 8 are changed in the "Complainants' Exhibit Wilson Underreamer," the blocks being extended down a little further between the cutters, and instead of having the pins 8 passed partly through the sides of the block and being parallel one on each side of the block, the two pins are short and are screwed into the sides of the body with pin-like extensions on their end, which fit into holes in the block. The construction is mechanically equivalent, the change being made to effect easier removal and placement of the block. In "Complainants' Exhibit Wilson Underreamer Number 2," the block 7, shown in the patent, is now used, the spreading feature on the lower end of the block being replaced by having an enlargement on the lower end of the T-rod with faces on the sides on which prongs are which bear against the cutter shanks when the reamer is in expanded position. The spring, instead of resting on the block 7, as shown in the patent, bears upon a key which is placed through slots in the side of the body above the shoulders corresponding [284] to the shoulders 10 in the patent, and in order to place the key centrally a slot is cut through the T-rod for this purpose. In the underreamers shown in the patent the means of limiting the downward movement of the cutters was the safety-bolt 11. In the "Com-

(Testimony of W. W. Wilson.)

plainants' Exhibit Wilson Underreamer" a pipe is used on the T-rod for this purpose. In "Complainants' Exhibit Wilson Underreamer Number 2" the slot in the T-rod in which the stationary key is placed, is arranged so that the top of the slot strikes the key at the downward limit of the movement of the cutters. Comparing, now, the Wilson underreamer patent and the "Defendant's Exhibit Double Underreamer," taking first the cutter, the pocket 18, in the cutter shank in the Wilson underreamer patent, is replaced in the Double cutter by a slot cut clear through the shank of the cutter, which slot is longer and narrower proportionate to the cutter than the slot 18 in the patent. Also there is a hole passing through the shank of the cutter and through the bottom of the opening of the slot in the cutter for replacement of key retaining pin, which does not exist in the Wilson cutter. The cutter shown in "Defendant's Exhibit Double Underreamer" has a pocket cut in the back of the cutter, which pocket is for the purpose of allowing the cutter to collapse over the partition of the Double underreamer body or extension, which has no counterpart in the Wilson cutter shown in the patent drawing. Below this pocket on the Double cutter is a single bearing face, which face is placed on the shank of the cutter or the part thereof extending upwards from the body or main portion of the cutter, which face bears against the spreading partition of the body extension. In the Wilson cutter no such bearing face exists on the shank of the cutter. The bearing face in that cutter being the

(Testimony of W. W. Wilson.)

face 43, which face is on the back of the cutter body and which face tapers outwardly and upwardly with respect to the [285] center line of the cutter. In Double underreamer, shown in "Defendant's Exhibit Double Underreamer," the cutter spreading face mentioned is a parallel to the axis of the cutter. On the sides of the Cutter shown in "Defendant's Exhibit Double Underreamer," are retaining ways extending the full length of the cutter shank similar to the retaining ways 4.2 shown in the Wilson underreamer patent. At the lower end of the shank of the Double underreamer cutter are extra dovetail shoulders extending the length of the spreading bearings, which have no counterpart in the Wilson underreamer cutter. The form of the body shown in Defendant's Exhibit Double Underreamer" differs from that of the Wilson underreamer patent in that there are pockets cut on the sides of the body for the reception of wrench, which do not exist on the sides of the body of the Wilson underreamer. In Double underreamer shown there is a hole throughout the length of the lower body portion, which hole has a shoulder for the seating of the spring, which does not exist in the Wilson patent. The hole in this body, "Defendant's Exhibit Double Underreamer," extends on down throughout the length of the extension, while in the Wilson patent the hole for the mandrel rod and spring is carried only down to the shoulders 10. Below this point in the Wilson underreamer patent there is a large open space formed by the prong-like extensions of the body. This open

(Testimony of W. W. Wilson.)

space does not exist in the "Defendant's Double Underreamer" shown. In the "Defendant's Exhibit Double Underreamer" there is a central partition in the extension through which partition the hole for the mandrel rod is drilled, and in the sides of this partition are slots for the passage and movement of the key placed on the lower end of the mandrel rod. These slots, in "Defendant's Exhibit Double Underreamer" are long, narrow openings in the metal for the passage of the key. No such slots exist in the Wilson underreamer patent. At the sides of the partition of the Double underreamer [286] shown there are undercuts in the sides of the cutter pockets forming dovetails to act with those on the cutters. In the Wilson underreamer there are ridges on the insides of the prongs, said ridges shown at 2", which coact with the dovetails on the shanks of the cutters. In Double underreamer body shown in "Defendant's Exhibit Double Underreamer," there is a second dovetail groove at the lower end, which does not exist in the Wilson Underreamer patent. These differences named in the comparison with Wilson underreamer patent and "Defendant's Exhibit Double Underreamer" also exist between the Wilson underreamer patent and "Complainants' Exhibit Double Underreamer" with the exception that the lower extra dovetail shoulders on the cutters are not present in "Complainants' Exhibit Double Underreamer"; also the extra dovetail undercuts in the lower end of the body extension, which coact with these extra dovetail shoulders on

(Testimony of W. W. Wilson.)

the cutters, are also absent from "Complainants' Exhibit Double Underreamer." Also in "Complainants' Exhibit Double Underreamer" the shoulder at the top of the cutter shank, instead of being at right angles to the back of the cutters, is tapered downwardly and outwardly. Also the shoulders of the body against which these bearings engage are also tapered downwardly and outwardly. These shoulders in the Wilson underreamer patent being also at right angles to the backs of the cutters. The cutters shown in "Complainants' Exhibit Double Underreamer" have the bearing face on the back, move downwardly from its position on the shank of the cutter, as shown in "Defendant's Exhibit Double Underreamer" to a position partly upon the shank of the cutter and partly upon the upper inner edge of the body of the cutter. The cutters, "Complainants' Exhibit Double Underreamer," have decided extensions sideways of the body part of the cutter from the shank of the cutter, which do not exist in "Defendant's Exhibit Double Underreamer" [287] except to a small degree, but which are shown in the Wilson Underreamer Patent, figures 7 and 9, at 16. The tops of these shoulders of the cutters in "Complainants' Exhibit Double Underreamer" are tapered downwardly and outwardly instead of being perpendicular to the back of the cutter, as shown in Wilson underreamer patent. The body of "Complainants' Exhibit Double Underreamer" differs from "Defendant's Exhibit Double Underreamer" in that the sides of the lowest end of the partition

(Testimony of W. W. Wilson.)

V-shaped notches cut at the bottom of the body dovetails, which notches allow room for the sideways extension of the cutter bodies, when the cutters are in expanded position. This space, or shoulders, on the lower ends of these parts on the extension, are shown in the Wilson underreamer patent at 10; however they are at right angles to the axis of the body instead of being downwardly and outwardly tapered. The dovetail shoulders shown in "Defendant's Exhibit Double Underreamer" and "Complainants' Exhibit Double Underreamer" taper downwardly and outwardly, while those shown in "Complainants' Exhibit Wilson Underreamer" and "Complainants' Exhibit Wilson Underreamer Number 2" and in the patent, are parallel to each other and to the axis of the reamer body. The upper shoulders on the bodies of the cutters shown at 16 of the patent are shown to contact with the shoulders 10' on the underreamer body; however, the "Complainants' Exhibit Wilson Underreamer" and "Complainants' Exhibit Number 2 Wilson Underreamer," these do not contact but a space is left between them when the cutters are in expanded position. In "Complainants' Exhibit Double Underreamer" there is a space left between these shoulders; they do not contact when in expanded position. The T-bars shown in "Complainants' Exhibit Wilson Underreamer" and "Complainants' Exhibit Wilson Underreamer Number 2," consist of a rod on the solid lugs 5 on the bottom thereof similar to the drawing figure [288] 11, such shoulders being for engagement with the cutters.

(Testimony of W. W. Wilson.)

The mandrel rods for "Complainants' Exhibit Double Underreamer" have a removable key at this point.

Q. 361. Have you anything further to state in comparison of the construction of the cutters shown in "Defendant's Exhibit Wilson Patent" and the cutters shown in "Complainants' Exhibit Double Underreamer?"

A. The cutters shown in "Complainants' Exhibit Double Underreamer" differ from those of "Defendant's Exhibit Double Underreamer," aside from the previous remarks, in the length of the shank of the cutters, that of the "Complainants' Exhibit Double Underreamer" being shorter than that of "Defendant's Exhibit Double Underreamer." Also the length of the body of the cutter "Complainants' Exhibit Double Underreamer" is considerably longer than the length of the body of the cutter "Defendant's Exhibit Double Underreamer." Also the width of the body of the cutter "Complainants' Exhibit Double Underreamer" is wider than that of the "Defendant's Exhibit Double Underreamer."

Mr. BLAKESLEE.—Direct examination closed.

Mr. LYON.—Cross-examination is reserved until the witness has produced the drawings requested.

STIPULATION.

It is further stipulated and agreed that the R. H. Herron Company and Oil Well Supply Company, in 1899 had places of business and stores at Los Angeles, Los Angeles County, California; San Francisco, California; Coalinga, California; and Bakers-

field, California; and that such places of business or stores were continued from and during 1899 continuously to date.

It is further stipulated and agreed that the page 82 of the Oil Well Supply Catalogue of 1900, and Figures 1713, 1715, 1717, and printed matter accompanying same, heretofore exhibited to [289] different witnesses in this case, is offered in evidence and marked, "Defendant's Exhibit Page 82 Oil Well Supply Company's Catalog of 1900"; and it is stipulated that this exhibit was published by the said Oil Well Supply Company in 1900 and generally circulated in 1900 and 1901 throughout the oil-well trade in California and elsewhere.

And it is further similarly stipulated that Fig. 2161 of the Oil Well Supply Company's Catalog of 1900, appearing on page 117 of said catalogue, and heretofore referred to by some of the witnesses, is offered in evidence as "Defendant's Exhibit Fig. 2161 Oil Well Supply Company's Catalog of 1900," and that such catalog was published, with said figure in 1900, and distributed throughout the oil fields of California and elsewhere during 1900 and 1901. The stipulation in regard to "Defendant's Exhibit page 82 of Oil Well Supply Company's Catalog of 1900" and this "Defendant's Exhibit Fig. 2161 of the Oil Well Supply Company's Catalog of 1900," is not to be understood, however, as stipulating that these 1900 catalogues were not circulated or used or known after 1901, but the stipulation is limited to 1901 as the Oil Well Supply Company, of Pittsburg, Penn-

sylvania, issued a catalog of 1902, which it is conceded was published long after the date of the application for the Double patent in suit, although such 1912 catalogue contains these same exhibits, "Defendant's Exhibit Page 82 Oil Well Supply Company's Catalog of 1900," and "Defendant's Exhibit Fig. 2161 Oil Well Supply Company's Catalog of 1900."

It is further stipulated and agreed that page 80 of the said Oil Well Supply Company's Catalog, with stipulations similar to the foregoing in regard to its date of publication and distribution, is offered in evidence and marked "Defendant's Exhibit Page 80, Oil Well Supply Company Catalog of 1900."

It is stipulated and agreed that the underreamer marked [290] "Defendant's Exhibit Sample of Swan Reamer" is a substantial embodiment of the construction and interrelation of parts shown and described in "Defendant's Exhibit Swan Patent 683,352" and that the device marked "Defendant's Exhibit Sample Austrian Reamer" is an embodiment of the "Defendant's Exhibit Page 82, Oil Well Supply Company's Catalog of 1900," with the omission of the key which is shown in block in Figure 1713 just above the cutters and froming a block above such cutters, and with the omission of the spring-actuated mandrel and spring and with slight modifications in the forms of the cutters or bits from those shown on such page 82.

Testimony of John O. Dart, for Defendant.

JOHN O. DART, called as a witness on behalf of defendant, deposes and testifies:

My name is John Oscar Dart, age, 48 years; oil well driller. I have been connected with the oil wells in all capacities and have been drilling continuously up to the first of January last. I am familiar with underreamers. My first experience was with the Austrian Underreamer. I have had a whack at them all ever since. The Double, the North, and the Wilson, and old Leidecker—preceding all those—one Mel Kellerman got up, one we called the “Old Betsy.” That never was very successful, but then I had a whack at it just the same. I can’t state as to just what dates I used each and every underreamer; but right along, two or three times a year at least ever since 1897. I have been using different underreamers weeks at a time, months at a time. A fellow by the name of Ed. North, at one tie with the Pacific Coast Oil Company, when I first knew him. He is a lame man and he got up an underreamer down here that I used in 1901 and 1902, and later. I don’t know, forget his initials. Ed. North is what he is known by all over the State. I don’t know that it is very much different from the general principle of the Double and [291] Wilson. There was a set of lugs resembling these here, somewhat; held in place by a spring, and that was pulled down, with the exception that there was a block in the center in here. (Witness points to space between the cutters in “Defendant’s Exhibit Double Underreamer.”) I used

(Testimony of John O. Dart.)

it in Coalinga on the Westlake Rummel Oil Company property. It was in the fall or winter of 1901 and 1902. I underreamed quite a bit with it. It underreamed a very hard shell and I carried the casing down to the depth that the company required. I used a good big regular drilling stem on it and North instructed me to "Give it h——; I want to see what it will stand," and I did; and it stood it. It underreamed the shells and the pipe went down. I later used a $7\frac{5}{8}$ North Reamer in the early part of 1903. I used it for The British California Oil Company. We had just one bad shell to ream about 16-feet thick, we underreamed it and put the casing down.

I had no trouble with either one of those North reamers. I have since endeavored to obtain North reamers as I like them; I thought well of them. I would go to the supply houses to rent one of them and they would not have them in stock. While working for the Eastern Consolidated Oil Company at Gaviota I had occasion to need an underreamer; I telephoned to the Fairbanks-Morse Company at Santa Maria and Los Angeles and they did not have one. I telephoned to the Oil Well Supply Company. None of them had a North underreamer in stock. In my opinion the North underreamer at that time was the best underreamer on the market. At that time there were the Leidecker underreamer, the Austrian underreamer and the Double reamer all obtainable which was in 1904. That was when I was working for the Eastern Consolidated Oil Company. I finally got a Double reamer and used it.

(Testimony of John O. Dart.)

At the time I used the North underreamer in 1901 and 1902, [292] the Double underreamer was scarcely perfected. I corresponded with North in 1902 about his underreamer.

(The letter referred to is offered in evidence as "Defendant's Exhibit Letter John O. Dart to Edward North, of March 15, 1902.")

My last drilling was last January in Maricopa; I used both Double and Wilson underreamers. I liked the small sized Wilson underreamer better than the Double. I prefer the small size Wilson to the small size Double. I have used many Wilson reamers. I always use them in a small size hole.

I have never broken or lost any part of a Wilson underreamer.

The North underreamer that I used had two latches. At the time I inquired of Fairbanks-Morse for a North underreamer they told me that they were not being manufactured, that they were not in stock and they advised me to use the Double.

I found no difficulty whatever in using a North underreamer. The Leidecker reamer I used was substantially like "Defendant's Exhibit Swan Patent, 683,352." I used to have a great deal of trouble getting it into the pipe at the bottom. After reaming for a while I would nearly always have to jar it into the pipe; it was not satisfactory, compared with the reamers of to-day. Referring to the difficulty found with the Kellerman reamer. Well, it was—had a hell of a time getting it down and a worse time

(Testimony of John O. Dart.)

getting it back; never was a success. I don't think we ever did any reaming with it.

The Austrian reamer was certainly better than no reamer; it was the first that we ever used in this field; the first that was used, I believe; the first I ever saw used in California, although I believe there may have been others—I am speaking from my own experience. The chief trouble with the Austrian was [293] that the dogs or cutters were so light that we would break them off; continually breaking them off. Also the cutting surface was narrow, such a small segment of a circle; very slow reaming; and frequently it would what we call key-seat the hole; would not have near all the hole underreamed and the pipe would not fall.

The trouble which Mr. North states he had with his underreamer when he states that the cutters had to go too far below the casing before the cutters were sprung into operative position;—"in some cases where there would be, as near as I could figure it out, a small cave just below the casing, the cutters would throw apart and catch, and perhaps on some protuberance there, and the weight of the tools would come down on that and pry the T-head off the spring-rod and leave the cutters in the hole," and all because he run his reamers too close to the pipe. The remedy for that trouble would have been to get a new drill.

Testimony of Martin Barber, for Defendant.

Barber testifies and states as follows:

My name is Martin Barber; resident of Los Angeles; age, 56 years: Occupation, oil and refining. I have been in the oil business about 18 years. Have done everything connected with it. Have for the last 14 years been general superintendent of all the Santa Fe Oil Co's property. Have done actual drilling myself; yes, sir. I am familiar with underreamers. Have used the Austrian underreamer, the Swan, or Leidecker, the Fox underreamer, the North, the Double. Used the North underreamer in the Fullerton field in 1902.

Q. 9. What did you do with the North reamer at that time and place?

A. Well, we underreamed holes with it.

Q. 10. How many holes, approximately?

A. Oh, used that in a half dozen different holes, I [294] guess.

Q. 11. What results did you get?

A. Same as with all of them. They were good as long as they were made so they would go down in the casing all right and and pull out all right. Some of them, after they were used a while, they become worn and would have a hard time to get them down the hole and a hard time to get them back out.

Q. 12. What reamers do you refer to in making this criticism? A. All of them, at that time.

Q. 13. What other experiences did you have in using the North reamer?

A. Well, when we first got it it was an improve-

(Testimony of Martin Barber.)

ment over any thing that we had ever had, and we come to the conclusion we had struck the right reamer; and as I say, later on, it began acting bad, then we come to the conclusion there was defects in that that should be remedied. We reamed with North reamers about 2,100 feet deep. We did not run the North reamer very long, probably four or five months. It is like reamer as disclosed in Patent No. 674,793. I wrote a letter to Mr. North recommending the North underreamer. That letter was the truth at that time, as far as I knew.

We had difficulty with this Swan or Leidecker reamer, both getting into and out of the hole. I could not tell exactly the reason, only it was not made right. It did not give satisfaction, no, in either of them nor the Austrian.

The Austrian underreamer or the Swan reamer would all ream when you got them down, and they enabled us to get the casing down. The worst part of them was getting them down, and into the casing again.

(Defendant's Exhibit Letter of March 19, 1902, Martin Barber to Edward North here offered.) [295]

**Testimony of W. W. Wilson, for Defendant
(Recalled).**

W. W. WILSON—Testimony Continued.

Referring to the O'Donnell and Willard underreamer, and patricularly to that portion which is wedge-shaped and which forms the partition between the cutters, which partition is designated as "3" in the patent,

(Testimony of W. W. Wilson.)

When the bits are in the collapsed position their inner faces rest against the lower end of the partition 3, and in expanding as the bits move upward over this partition the partition causes them to spread apart, due to the material that it introduces between the cutters.

The taper of the bore allows the upper ends of the shank to spread outward, causing the points of the cutters to tilt inward by their tilting action over the lower end of the wedge-shaped partition.

If the wedge-shaped partition, or that portion of it just about the circular showing of the spring pressed bolt 16, were cut away, the expansion would then be due solely to the tapering action of the pocket in which the cutters lie. The cutters would then be pressed inward against each other and fulcrum near the lower end instead of having this fulcrum acting over the rounded surface over the lower end of the wedge-shaped partition 3, the cutters on being drawn down would contract due to the movement outward of the upper ends of the shanks on the tapered faces of the bowl of the body, and on moving upward would expand due to contraction of the upper ends of the cutter shanks and the moving of the cutters against each other at fulcrum point near the bottom.

The swan underreamer expands by having the cutters move upward and on outwardly inclined faces on the reamer body. With the O'Donnell & Willard the cutters fulcrum over the lower end of the partition 3, part of the expansion being caused by the

(Testimony of W. W. Wilson.)

[296] cutters moving up over this partition and part of it being caused by the upwardly inwardly tapering pocket in which the cutter shanks move. It is also somewhat similar to the Swan in that a portion of the expansion is occasioned by the tapering wall or partition. In the Swan underreamer the cutters do not tilt, as the O'Donnell & Willard underreamers cutters do. The mode of expansion of the cutters in these two devices is not the same. The only similarity being the expansion caused by tapering ways. With the Wilson underreamer there is no expansion of cutters caused by the dovetail as they are parallel, consequently can give the top of the cutters no tilting and thereby cause expansion. The dovetails on the upper ends of the shanks of the cutters are at all times in contact with the dovetails on the body, but that contact produces no expansion.

Q. 388. Permit me to interrupt you, Mr. Wilson, but also answer with relation to the absolute elimination of dovetails.

Mr. BLAKESLEY.—That was the question, wasn't it?

Mr. LYON.—That was the question but—

Mr. BLAKESLEY.—He means if the dovetails were entirely removed.

A. Oh, I thought he meant the tapering action. (Questions Numbers 386, 387 and 388 read by the reporter.) If the dovetails (of Double reamer) were removed there would be no means of holding the cutters against the body, and they would be lost in

(Testimony of W. W. Wilson.)

the hole. And also in soft formations there is a tendency to spread the lower ends of the cutters apart when the blow is struck. There would then be no means of retaining the cutters against this action; they would soon spread apart and be lost. Therefore, dovetails, or some means of limiting the outward movement of the shank of the cutter, is necessary to the operation of the reamer. Should there be dovetails used, but such dovetails placed so as to produce no expansion of the cutters, the only way that this [297] could be done would be by making them parallel to each other and to the axis of the reamer body. The sole expansion of the reamer would then be by the wedge or spreading shoulders at the bottom of the hollow slotted extension, which would reduce the expansion of the cutters by the amount caused by tapering these dovetails. The only way expansion could be increased would be by the thickening of the partition placed between the cutters on the body expanded, which thickening would leave less room for the shanks of the cutters. Also to allow for expansion a deeper notch would have to be cut in the back of the cutters, thus greatly weakening the shanks of the cutters. In the drilling nowadays, particularly with the smaller sized reamers, it is necessary to have a large amount of expansion of the cutters, because the reamer must go down inside the pipe and expand so as to cut a hole large enough for the collars to follow; and the big, heavy pipe or casing used nowadays make these differences in the diameters of the inside of the pipe

(Testimony of W. W. Wilson.)

and outside of the collar very material. Hence, in the Double reamer as shown, the expansion caused by the dovetails being tapered is very important and necessary to give the cutters strength sufficient in the shanks and also cause the cutters to expand properly. In the Wilson underreamer, this difficulty is avoided by the great width possible to make the spreading bearings without limiting or weakening the cutter shanks.

Q. 389. (By Mr. LYON.) Read the witness the question once more and see if he has answered it as fully as he can or desires to.

(The questions numbers 386, 387 and 388 were read by the reporter.)

A. It is certain that a great difference in the comparisons would be made by the elimination of the expansion of the dovetails in the Double underreamer patent and exhibits. This would give to the cutters an entirely different tilting action and its expansion would then become more of a pivotal action to the cutters; [298] in fact, it would be quite a different underreamer in principle from that shown in the patents and exhibits; and in so far as this expanding action is caused by the tapering of the dovetails would vary the answers given to that extent; and I believe, under our modern requirements for reamers, would render the tool impractical except for light reaming.

The dovetails on the reamer body of the Wilson reamer in a degree cause or compel the shanks of the cutters to travel in a definite line and in that respect

(Testimony of W. W. Wilson.)

coact with the swinging action of the cutters and thus guide the shanks of the cutters to expanded position, however they lose no inward or outward movement of the cutter shanks.

I have produced a drawing of hypothetical underreamer, which I have designed, in which I produce a thin film of metal joining the prongs of the extension of the Wilson reamer, the same being at the outer periphery of the body and which also does away with the dovetail shoulders, both on the reamer body and on the cutters. The strength of these cutters would be about 9-16th of the strength of the Standard Wilson underreamer cutters. However the reamers could be constructed with stronger cutters and heavier shanks.

I believe the North improved underreamer, as exemplified by the circular of the North improved reamer, would be an operative underreamer and practical. It might not be as strong as the late style underreamers.

I think the Jones patent reamer would probably give more trouble in getting it in or out of the casing than the original North reamer, as shown in the Union Oil Tool Co. circular.

Q. 424. Are we to understand you, Mr. Wilson, as testifying that the inter-engaging shoulders or dovetails on the Wilson reamer, either as shown in "Complainants' Exhibit Wilson Reamer" or in "Complainants' Exhibit Wilson Underreamer No. 2," perform no part in the expansion of the bits?

(Testimony of W. W. Wilson.)

A. Yes, sir; I cannot see where they perform any part in the operation of the expanding of the bits of the Wilson underreamer, they being parallel, and any movement up or down would make no difference in the expansion of the cutters.

Q. 425. Then, if you cut off the side shoulders or dovetails from the shanks of the bits of such Wilson underreamer, the bits will expand in identically the same manner as in such exhibits as now constructed?

A. No, sir, they confine the shanks of the cutters to certain zones of movement, however, add nothing to the expansion movement of the cutters or movement outward of points of the cutters.

Q. 426. Explain fully on the record what the movements last referred to by you as effected by these dovetails in the Wilson reamer are.

A. In expanding or collapsing of the cutters, the dovetail shoulders confine the movement of the pivotal axis, which is at the intersection of the planes of the outside of the dovetail shoulder and that of the beveled upper portion, to vertical lines along the body.

Q. 427. In answer to question 382, in reference to the Double underreamer, you say, "The elimination of the dovetails referred to would eliminate the expansion of the cutters due to the cutters traveling in the inwardly upwardly tapering dovetail ways and would therefore eliminate this portion of the expansion of the Double underreamer." Please state definitely what portion you refer to in this answer.

A. The way that question was put, it was hard

(Testimony of W. W. Wilson.)

for me to imagine an underreamer being made operative under those circumstances.

Q. 428. Is that the best you can answer?

A. No, I will fix that. However, without the tapering dovetail ways on the body, tilting action would be difficult to [300] attain unless some other means were provided to allow for the tilting of the cutter shank due to the engagement with the dovetail ways. This would, of course, eliminate the expansion caused by this action in the operation of such a supposed underreamer.

Q. 431. What, in your opinion, then, would be the result in [301] the Wilson reamer, if the inter-engaging dovetails of the body and shanks of the cutters were removed with respect to the expansion of the cutters as defined by you in your last answer?

A. Some means would have to be provided to hold the top ends of the cutters against the T-bar or in substantially the same position that they are held by the dovetails; however, the removal of the dovetails, providing the upper ends of the cutters were maintained in their relation to the T-bar as they are now, would make no difference on the expansion of the underreamer. That would not be the case with the Double underreamer. In expanding the Wilson underreamer cutters their sole means of expansion is the inclined faces or spreading bearings at the lower ends of the prongs of the reamer body. With the Double underreamer the cutters are expanded partly by the spreading wall or partition or namely the lower end of the hollow slotted extension, and

(Testimony of W. W. Wilson.)

partly by the teetering action of the cutter on that partition due to the upper end of the cutter following the upwardly and inwardly inclined dovetailed ways. When the cutters of the Double reamer are in completely expanded position they can get no further apart, and they cannot ride up over the wedge-shaped or inclined spreading surfaces without getting to this completely expanded position. This is also true of the Double reamer.

A. 442. Yes. However, in the expansion of the Wilson underreamer, the expansion due to thrusting the lower tips of the prongs between the cutters is their sole means of expansion. However, in expanding the Double underreamer, this means of expansion has added to it that caused by drawing the upper ends of the cutters together by the tapered dovetail ways and rocking them over the fulcrum which is near the center of the cutter where it bears against the point of contact with the hollow slotted extension, causing further expansion of the cutting points.

The upper end of the Wilson underreamer cutter namely that portion above the suspension means, move, due to the tilting action [302] of the cutter which is caused by the slight bevelling of the dovetail, slightly toward each other as the cutters expand, but that motion is caused entirely by the spreading bearings at the lower end of the prongs, which swing the lower ends of the cutters outwardly and at the same time throw the upper end of the cutters inwardly, namely that portion of the cutters which is above

(Testimony of W. W. Wilson.)

their suspension means. That swinging action at the upper end of the Wilson cutters when collapsing or expanding is merely the effect of [303] interposing the wedge-shaped projections of the lower end of the prongs between the cutters and spreading them apart at the lower end and *vice versa* on collapsing. Movement of the cutter in tilting outward causes slight inward movement of the upper end of it. The amount of this movement will vary in degree with the distance at which the pivot point varied from the top of the cutter." With a Double underreamer that action is entirely different as the Double underreamer cutters, while sliding on their suspension means, namely the key, at their upper ends, travel inwardly due to the inclination of the dovetailed ways on the reamer body which in turn expand the lower ends of the cutters, namely that portion of the cutters beyond the fulcrum part on which the cutters rest at their spreading bearing. That action is entirely different from anything found in the Wilson underreamer cutter. With the Swan underreamer the full length of the dovetails on the cutters engages the inner faces of the dovetails on the body throughout the entire length or travel of the cutter. With the Double underreamer, the dovetails being tapered downwardly and outwardly allow the cutter-shanks to bodily move outwardly as the cutters go downwardly into collapsed position, causing further collapsing of the cutter by reason of its tilting over the fulcrum near the lower end of the shank, and the outward swing of the cutter at its upper end. With the Wilson underreamer the dove-

(Testimony of W. W. Wilson.)

tails of the body control the pivotal point of the cutters so that the upper end of the cutters at the fulcrum point cannot swing outwardly or inwardly as the cutter collapses or expands. This is due to the fact that the Wilson underreamer cutters travel in parallel dovetails.

The Wilson underreamer is the only one the dovetails of which are solely for the purpose of holding the cutters in the reamer body. With the Swan and the Double underreamers the dovetails [304] on the reamer body perform a dual function namely retaining means and also expansion means. The O'Donnell & Willard reamer and also the Double reamer employ the upwardly and inwardly inclined retaining means as an expansion means, as well as a retaining means. The underreamer disclosed in my hypothetical drawing would as far as I am able to learn be a practical reamer.

(Complainants offer in evidence the drawing referred to and known as the "Hypothetical Reamer" and ask that it be marked "Complainants' Exhibit W. W. Wilson Hypothetical Underreamer Drawing.")

With the hypothetical reamer the riding point of the cutters against the inner walls of the casing would be lower than the corresponding bearings on the Wilson underreamer cutters. This however would make no difference in the results. [305]

Testimony of Thomas A. O'Donnell, for Defendant.

Mr. O'Donnell testifies as follows:

My name is Thomas A. O'Donnell; age, 42; residence, Los Angeles; occupation, oil producer. I was

(Testimony of Thomas A. O'Donnell.)

born in the shadow of an oil derrick in the State of Pennsylvania. Have been actively engaged in the oil business in California for twenty-three years. I know of nothing in connection with the business with which I have not had experience. I am president and general manager of the American Oil Fields Company and of the American Petroleum Company, and a director and owner in several other companies. President of a few smaller companies, and vice-president and general field manager of some of the companies.

I am familiar with underreamers. I have used the Austrian underreamer quite extensively in the early 90's. I am also familiar with the Swan underreamer. I have used a reamer which myself and Mr. Willard patented. I then used the Double reamer and the Wilson reamer. I think I have also used the Plotts reamer.

Q. 19. Yes. Start in, please, and tell us about the beginnings of the invention, and anything you have to say with respect to it, in the early stages of it.

A. At the time that I became interested in this reamer, Mr. Arthur Willard was a machinist working in the Baker Iron Works. I was a producer and contractor and had a great deal of work done in that shop. Mr. Willard, at some time that I would place somewheres between the years '97 and '99, presented me with some drawings that he felt would eliminate the difficulties that we had in the use of the Austrian reamer that we were then using most extensively and with which we had had various kinds of difficulties.

(Testimony of Thomas A. O'Donnell.)

And the first set of drawings, as I recollect it, did not seem to me to be practical, and I made some suggestions to him, and he presented a second set of drawings. I think at that time that he [306] asked me if I would not put up the money and try to go in with him and devise a reamer that would be an improvement on the reamers then existing, and I told him I would, with the idea that he would submit it to me and I would pass my judgment, first, on whether it would be an improvement or be workable when it was completed. I don't remember any of the details leading up to that arrangement, except that I was to put up the money and did put up the money and helped him in the planning of it. We then got some drawings that appeared to be satisfactory to both of us, and had a model made. My recollection is rather dim in connection with the model, but it seemed to me at that time it was necessary for the patent attorneys to have a model from which to make drawings or submit proper authorities. We then figured on making one of the machines themselves, and about that time some traveling salesman for a tool house, a manufacturer, in the east—and my recollection is that he was interested in some way with the Swan reamer—was trying to sell me Swan reamers; and I showed him this model, and was able later to make one of them. He seemed to be much impressed with it, and I made an arrangement with him to buy a reamer through the W. T. McFie Supply Company. That reamer was to be according to a model that I then had, of $7\frac{5}{8}$. The model was

(Testimony of Thomas A. O'Donnell.)

shipped to them, and there were several months intervening before this reamer was shipped to us, and various excuses advanced for delay. I think I received the reamer in 1900, along about September, the 1st of September, or October. I would not be definite as to exact dates. Of 1900. That reamer I used out here in the local fields on several different occasions. At the time that I got the reamer, I had a number of Austrian reamers. And the reamer, from the commencement, after the knives got worn, gave us a great deal of trouble getting it down the hole. The occasions on which I used it I generally personally supervised the use of it, to become familiar with its defects, if any, and to make a successful operation; and [307] it occurred where we had very hard shells we desired to ream right in the bottom where we could not use the Austrian reamer with success. The first reamer created a great deal of enthusiasm in myself for its future, and I rented it to some parties that I am now unable to call their names—I have tried to see if I didn't have any records leading up to their names—that were operating up around the Newhall district that had some very heavy reaming to do, and they paid me a rental on the machine and seemed to be very much enthused about it. I then had Arthur Willard, who was working for the Baker Iron Works, make another; and this one was 95/8. It was necessary, in order to have this done, for me, in order to place it with the Baker Iron Works, to have the work done and request them that Willard be permitted

(Testimony of Thomas A. O'Donnell.)

to work on it. He was working there for a salary at the time. That reamer I intended to use down at Whittier, where they are drilling some wells that had some very hard underreaming in.

Q. 20. Let me interrupt, for the purpose of putting a question just at this point, and ask you if you recollect when this order for this second reamer was placed with the Baker Iron Works.

A. I can't recollect the dates, not even the month, except that it was shortly after we were done experimenting with and using the 75/8. It was in the fall of 1900—the summer or fall of 1900.

Q. 21. Now, please continue.

A. I was interested in Whittier at that time in what was known at that time as the Fidelity Oil Company. I had associated with me a man by the name of Harris, and Mr. Harris was interested in an oil company named the Mora or Elmora. I am not sure which. I was not personally interested in this well, but they had some 95/8 casing in their hole which they could not underream with the reamers which they then had, and as this reamer was just finished [308] I ordered it shipped to them and myself went up there and underreamed this particular shell that they had trouble with. The reamer was then moved down to my own property that was about half a mile from that property, on which I was drilling two wells. We had in use on those two wells some of the old Austrian reamers, but at least three occasions that I remember quite well we used the 95/8 on the hard shells that we had at that point. One of the

(Testimony of Thomas A. O'Donnell.)

principal difficulties in the construction of this reamer was the tendency of the knives to wedge and hold up in going down the casing and after they became worn and it became necessary to dress them we had to tie them with ropes and wedge them with sticks to get them in the hole, which caused considerable annoyance. On the finishing of those two wells, I was also interested in a property known as the Alliance Oil Company—in fact, I was the principal owner of it; afterwards paid its debts—drilling a well at the mouth of the San Fernando Tunnel. The formation at San Fernando Tunnel is a great deal of granite and limestone—very hard—and in view of the difficulties that I had had in getting this reamer in and out of the hole out at Whittier—well, into the hole; no difficulty in getting it out—I advised Arthur that it seemed to me to be necessary for us to devise some scheme to hold those knives down without the necessity of tying them and wedging them with sticks; and he devised a plan that consisted of a collar acting as a sleeve on top of the reamer, with projections of some kind that I am not now familiar with running down to these knives to hold them down while it was passing through the casing. They were using $9\frac{5}{8}$ casing at this Alliance well and I sent this reamer up there with the new appliance on it for holding the knives down, and advised Mr. Willard that I would like to have him go up and show my drillers what his ideas were in holding the knives down; and he done so. I was up there a couple of days afterwards myself and they had been working

(Testimony of Thomas A. O'Donnell.)

with [309] the reamer nearly continuously for that two days but had succeeded in underreaming some very hard limestone, I think it was, or granite. It was about as hard—it was one of the hardest formations that I ever drilled a well in in California. But he was experiencing a great deal of difficulty, principally with the sleeve on top of it, with the sand getting back of the sleeve and preventing its free working and it was necessary to be very careful and have that washed out very carefully, and I stayed up there a couple of days myself to assist him in overcoming that difficulty. My judgment was then, and is yet, that the sleeve was no improvement at all and was a detriment. That is the story, as it appears to my mind in just thinking it over. I have not had the opportunity I would like to have had to look up these matters. I have been very busy with other things.

Q. 22. Can you state what became of the first of these O'Donnell & Willard underreamers which you used?

A. Well, I had ambition to make money then, to get some of my money back, by renting it around San Fernando, where they had difficult underreaming, and it was used up there, and my recollection is that I had sent it down to the Baker Iron Works to have some more knives made for it or the bowl bored out. It had become very badly worn. I don't remember ever doing anything more with that particular reamer.

I do not know where it is now. The second O'Donnell & Willard underreamer was moved from the

(Testimony of Thomas A. O'Donnell.)

well that was built at the mouth of the tunnel down to the local field here. It was put into a storehouse that I had out here for accumulated junk. It was not immediately moved to the place I have in mind. The well at San Fernando Tunnel was a failure and all of the material was moved down to a lease that I was interested in called the Hubbell Lease that is out adjoining Sixth Street about two blocks west of Westlake Park. I had a general storehouse that was on [310] Bonnie Brae Street, called the O'Donnell Oil Company storehouse, and at various times my tools and equipment was picked up and carried to that storehouse, and among it this reamer, and it remained there until recently. I saw this O'Donnell & Willard reamer at the shop of the defendant the other day. Mr. Arthur Willard pointed it out to me. He said. "That looks like the old girl, doesn't it, that we used to monkey with"—something like that. It was tagged "Defendant's Exhibit O'Donnell & Willard Underreamer."

The O'Donnell & Willard underreamer now under discussion with the witness is again to be offered in evidence as "Defendant's Exhibit O'Donnell & Willard Underreamer."

William Grant Lehman was one of the drillers at Newhall who operated said second O'Donnell & Willard reamer. I don't know the other fellows' names. Mr. Lehman was with me a great many years. The other men were not permanent. I saw Mr. Lehman here in Mr. Blakeslee's office a few minutes ago. He is superintendent for the Bellridge Oil Co. in Kern County. I do not remember the depth we went with

(Testimony of Thomas A. O'Donnell.)

the second O'Donnell & Willard reamer. Out at Whittier I am unable to state the depth of the Mora or Elmore hole, but I would say it was approximately six or seven hundred at the time the reamer was used. The two wells in Whittier, about eight and nine hundred. I have no recollection as to the thickness of the shells you drilled through with this second O'Donnell & Willard underreamer. On account of the difficulty of getting it in and out the hole, I used it principally on hard difficult shells with the Austrian reamer. The Austrian reamer we had in use—our difficulty with that was that it was hard to ream directly in the bottom on account of it having a projection below and the hard [311] shells would prevent its proper working; and then, again, when the shells were hard, it would dodge off of them and cut key-ways through the shell. And it was only in those cases that I used this reamer during that time, that is, where I could not get along with the Austrian. I never did attempt to ream any shells that I could not get through them with the O'Donnell & Willard reamer. I had a great deal of difficulty with them, but I always got through the shells that I started. Well, the Newhall district, particularly where we were working there, which was an error in judgment as to location, is one of the most difficult wells that I ever did drill, the hardest formation—practically solid rock standing on end. It is at this end of the tunnel, to the left going into the tunnel, very close to it. The formation that the well was drilled in is not the same formation that is in the tunnel. The well was drilled on some reefs

(Testimony of Thomas A. O'Donnell.)

that ran clear across the country this side of the tunnel, so my judgment would be that the formation in the tunnel would be no comparison at all with what the well was drilled in.

The first heavy casing same into use I think in about 1903. I used wire drilling line as early as 1895 or 1896, but it was generally supposed it could not be done. But I used wire line about the time I was experimenting with the O'Donnell and Willard reamer.

The calf wheel came into general use in about 1904, it was experimented with and used quite frequently before that time.

About four or five years ago I had another O'Donnell & Willard reamer made by the Wilson & Willard Mfg. Company. It was taken to Coalinga. We used it some out on the Octave Oil Company lease. I am not sure whether it is the Octave Oil Company now. We didn't get any better results than we got from our former reamer. The partition for holding the knives down didn't work any better than the former one did. The reason I dropped it at [312] that time, I took charge of other big properties and I didn't consider it was fair to the people I was working with to do any experimenting with it; I would rather leave it to somebody else, so that I could not be criticised for it. That was the reason I left it at that time. I thought I was going to work up there in which I could use it, but I changed my plans.

Q. 85. What can you say for your reasons for not making any other O'Donnell & Willard underreamers between the time you brought the second one

(Testimony of Thomas A. O'Donnell.)

to the storehouse of the O'Donnell Oil Company and the time you made this reamer shipped to Coalinga?

A. Well, there were several reasons. In analyzing my actions in the matter, I sometimes think I was rather foolish not to do it. I was very actively engaged in contracting and producing, and using what money I had, and had a great deal of trouble financing myself generally. It costs some money to experiment. And Mr. Willard, who was interested with me, didn't have any money of his own; and that is one of the factors that entered into it. I am not an expert from a mechanical standpoint myself, and while the idea seemed to be correct in principle, there were many mechanical defects that I didn't feel like spending the money or the time in working out—in fact, didn't have the money if I conducted my other business as it should be conducted. Since that time I have been very actively engaged in the oil well development business, and managing oil well properties. During my entire time to the present date I have had all of my available capital employed in the oil business.

I have never done any manufacturing on my own account. It is only quite recently, namely the last two or three years, that we have had machine shops in connection with our companies.

I first used the Double reamer in 1904 or 1905. The Complainants' Exhibit Double Underreamer, is the reamer resembling the Doubles I have used. I think the Double reamer works much better than our original reamer did. [313]

(Testimony of Thomas A. O'Donnell.)

Q. 110. In either one, but the method of the operation, how each one works, and then compare the working of one with the working of the other.

A. There is a difference of construction in the lower end of these reamers. The knives in both of them pull down and collapse for the purpose of drawing them in to pass through the casing below a partition. The partition in the original reamer of ours was detached and screwed in, while Double's was made all solid into the body. The principle of operating the knives, being on the bottom, where we had been wanting to put them for years, for strength, and so forth, was the same in both of them. Some of the mechanical parts leading up to that operation is quite different.

Q. 111. Have you ever, in any way, had your attention called to the Double underreamer in connection with any aspects of the O'Donnell & Willard underreamer?

A. Oh, yes; you mean by somebody talking it over with me, or—

Q. 112. In any way whatsoever.

A. Yes; Mr. Willard always has claimed that the principle of these reamers was the same. I have more or less agreed with him. But the mechanical perfection of the final construction as they now are has been materially improved in it. At the time Mr. Double had a former suit, I think with the—well, I don't know whether it was the one with the National Supply Company or not, but he had a suit

(Testimony of Thomas A. O'Donnell.)

in connection with these reamers—I got a letter from some patent attorneys from Washington calling my attention to the suit and noting that the suit had been persistently fought and wanting to know if I considered it of any great importance, and that there was an allowance in our patent—in a patent that I apparently was interested in, was the way the letter read—that in their judgment there could be contention made in connection with both of the reamers then being contended for in the courts; and I passed it over, as I have all of my experimenting connections with it. I didn't care to enter into any suits in connection with it, [314] and dropped it. I don't know what their purpose was, or anything. Outside of that, the only people I know of discussing it very extensively with is Arthur Willard at various times; that I always felt would like to do some experimenting and have me pay for it.

Mr. LYON.—I move to strike out each and every portion and sentence of the foregoing answer from the record and exclude it from consideration, on the ground that the statements referred to are not binding upon the complainants, not made in the presence of any of the complainants, and are incompetent and inadmissible, and as hearsay and not the best evidence.

Mr. BLAKESLEE.—Attention is called to the fact that certain of the statements referred to in this answer were statements in discussion of the O'Donnell & Willard invention, made by Messrs. Willard & O'Donnell, each to the other, and that the witness

(Testimony of Thomas A. O'Donnell.)

has testified that he and Mr. Willard jointly produced an invention which was concerned in the production of the O'Donnell & Wilson reamers testified about.

(Mr. O'Donnell's testimony cont.)

I think the first Wilson underreamer I used was made in Bakersfield. I think I used a couple of them about 1906-7, with fair results.

As to the O'Donnell & Willard underreamer made in 1908 will say that I do not know how many times the reamer was run into the well. I was there when it was first run into the well, but was not there any more while it was used.

As I have previously stated my reason for making no further effort to use it or to give it any more time was that I thought I would be criticised for experimenting with it on other people's property. If we lost the cutters of that underreamer on the property where it was used I am not familiar with it. I have underreamer knives planted all over that lease. I do not [315] know what became of that reamer.

I don't remember of having any conversation with Mr. Thos. J. Griffith, in regard to that reamer. I will testify that I had no conversation with him in regard to it. The O'Donnell & Willard reamer was made in 1908 through Mr. Willard asking me to have another one made with some ideas he had about dishing the bowl to hold those knives down. I told him to go ahead and make one and send it to me and send me the bill.

(Testimony of Thomas A. O'Donnell.)

The companies that I am associated with are using Double reamers principally.

Q. 111. Have you ever, in any way, had your attention called to the Double underreamer in connection with any aspects of the O'Donnell & Willard underreamer?

A. Oh, yes. You mean by somebody talking it over with me, or—

Q. 112. In any way whatsoever.

A. Yes; Mr. Willard always has claimed that the principle of these reamers was the same. I have more or less agreed with him. But the mechanical perfection of the final construction as they now are has been materially improved in it. At the time Mr. Double had a former suit, I think with the—well, I don't know whether it was the one with the National Supply Company or not, but he had a suit in connection with these reamers—I got a letter from some patent attorneys from Washington calling my attention to the suit and noting that the suit had been persistently fought and wanting to know if I considered it of any great importance, and that there was an allowance in our patent—in a patent that I apparently was interested in, was the way the letter read—that in their judgment there could be contention made in connection with both of the reamers then being contended for in the courts; and I passed it over, as I have all of my experimenting connections with it. I didn't care to enter into [316] any suits in connection with it, and dropped it. I don't

(Testimony of Thomas A. O'Donnell.)

know what their purpose was, or anything. Outside of that, the only people I know of discussing it very extensively with is Arthur Willard at various times, that I always felt would like to do some more experimenting and have me pay for it.

Mr. LYON.—I move to strike out each and every portion and sentence of the foregoing answer from the record and exclude it from consideration, on the ground that the statements referred to are not binding upon the complainants, not made in the presence of any of the complainants, and are incompetent and inadmissible, and as hearsay and not the best evidence.

Mr. BLAKESLEE.—Attention is called to the fact that certain of the statements referred to in this answer were statements in discussion of the O'Donnell & Willard invention, made by Messrs. Willard & O'Donnell each to the other, and that the witness has testified that he and Mr. Willard jointly produced an invention which was concerned in the production of the O'Donnell & Wilson reamers testified about.

Q. 151. Can you tell us the name of any one of the drillers or operators in or about the two Whittier wells that you drilled, or the Elmora Oil Company's well you had near Whittier, where you say this first O'Donnell & Willard reamer was attempted to be used?

Mr. BLAKESLEE.—Objected to as not in accordance with the testimony of the witness.

A. I answered the question by referring to the first

(Testimony of Thomas A. O'Donnell.)

one, which I didn't refer to as being used at Whittier. I have a recollection of one man in connection with the first one.

Q. 152. (By Mr. LYON.) Who is that?

A. Mr. Andrew Lester.

Q. 153. And that one was tried here in the Los Angeles fields, did you say? A. Yes, sir. [317]

Q. 154. What size was that reamer? A. 7 $\frac{5}{8}$.

Q. 155. What size was the second O'Donnell & Willard reamer? A. 9 $\frac{5}{8}$.

Q. 156. And who were the drillers that attempted the use of this reamer, either at the Elmoro Oil Company well or the two Whittier wells?

A. I can't call to mind the names of the drillers in connection with that well, with the exception of Mr. Lehman at the tunnel. That Elmora well, if that is the name—I am not certain of it—was not under my supervision at all, and I went up there myself to see the reamer underream, the shell that they had there, and brought it down to my own property.

Q. 157. Do you know a man by the name of Sam Frampton? A. Frampton?

Q. 158. Yes. A. Frampton?

Q. 159. Yes; F-r-a-m-p-t-o-n.

A. That name seems familiar.

Q. 160. Wasn't he one of the drillers or operatives at one of these wells at Whittier where it was attempted to use this O'Donnell & Willard reamer?

A. He might have been; yes.

Q. 161. Your recollection is not sufficiently definite to state positively?

(Testimony of Thomas A. O'Donnell.)

A. No. You will understand that I had under my supervision, and have had for a great many years a great many men, and it is hard for me to locate just the localities at which they worked and if it was not for the great interest I took in this particular reamer my own recollection would be entirely eliminated in connection with its use. [318]

Q. 162. Was this second or 95/8 O'Donnell & Willard reamer tried at all on the old Whittier Consolidated property at Whittier?

A. I don't think it was; no.

Q. 163. Do you know a driller by the name of H. Bailey?

A. H. Bailey? H. Bailey? I know a driller by the name of Bailey that worked for me a great deal. I can't recall whether his initial is "H" or not.

Q. 164. Did he work for you in the Whittier field?

A. Well, I am unable to give you the names of the men that worked out there at all. I won't attempt it, because I would get my mind confused and unintentionally make conflicting statements. It is a good many years ago.

Q. 165. Isn't it a fact, Mr. O'Donnell, that when you tried this reamer out in the Whittier field, you had a great difficulty in getting the reamer out of the well hole?

A. I never had any difficulty getting it out. I had lots of difficulty getting it in.

Q. 166. What was the difficulty due to?

A. It was due to, in my judgment, as I think of it,

(Testimony of Thomas A. O'Donnell.)

mechanical imperfections. The knives, while they were new,—if it had been profitable to run one and have new knives turned out as they come new, it would have worked all right. As the knives become worn a little on the head of them—or the back of them—and they were dressed around the derrick, we had a great deal of difficulty in getting them into the hole. We had to tie them down, put sticks—

Q. 167. You say that you never had any difficulty with any of these reamers in getting them out of the hole.

A. I never did. There might have been difficulty experienced as there is with all reamers. I have seen all kinds of them have trouble getting them wedged in the pipe at various times. I never seen one yet that was made that you didn't have [319] difficulty getting them out of the holes, and all kinds of difficulties with them.

Q. 168. Do you know Mr. L. C. Keyser, of Whittier?

A. I probably do, if he was at Whittier. I can't call him by name.

Q. 169. Isn't it a fact that he was one of the operators about the well when this O'Donnell & Willard reamer was used? A. In what capacity?

Q. 170. Employed on or about the well.

A. I don't know. But I would imagine, if he was, it was in some minor capacity, because the name don't seem familiar to me at all.

Q. 171. When was it that Mr. A. G. Willard de-

(Testimony of Thomas A. O'Donnell.)

vised this improvement of collar or sleeve with the projecting latches, and when was that put upon this second O'Donnell & Willard reamer?

A. That was about the first of the year 1901, about the time we started at the tunnel; and I have rather a distinct recollection of that.

Q. 172. You say that collar or sleeve on that device was no improvement but rather a detriment?

A. Oh, yes, I considered it of no assistance at all.

Q. 173. Did this 10-inch reamer that you sent out to Coalinga have on it the sleeve or collar?

A. No.

Q. 174. You discarded that device at that time, did you?

A. Yes; discarded the idea and the use of it at the tunnel well.

Q. 175. How long, to your own knowledge, was this 10-inch O'Donnell & Willard reamer used at Coalinga?

A. My own knowledge would not extend over an hour that I happened to be there at that time. The property was left in the charge of Mr. Lester and I was only there occasionally. [320]

Q. 184. Now, when you had this $9\frac{5}{8}$ O'Donnell & Willard reamer out at the Alliance well near Newhall, how many times, while you were there, was that underreamer run into the well hole?

A. Well, I stayed there the greater part of two days at one time in a hard reaming job, and they had difficulty with that collar, getting it in, and they were working the reamer the most of the time I was there.

(Testimony of Thomas A. O'Donnell.)

My general policy those days, and is up until almost the present time, whenever we have different difficult jobs around any of the wells, I get right in and take a part in it, take the drillers' end of it.

Q. 185. And how many times did you run the reamer into that hole during those couple of days?

A. Oh, I suppose twenty or twenty-five times. It was not always working right. We would pull it in and out, and had a good deal of trouble with it.

Q. 186. In what respect wasn't it working right and did you have trouble with it?

A. Had trouble with the sand getting in this collar and holding the knives down.

Q. 187. And what did that result in?

A. That resulted in making the tool ineffective in expanding the jaws when it got down below.

Q. 188. In other words, the jaws didn't expand?

A. Yes.

Q. 189. When those things happened?

A. Yes.

Q. 190. Do you remember how much you underreamed during those two days?

A. I think at that time we got in a joint of pipe that had been holding them up for some time, and I left when they were successful in doing it.

Q. 191. Then after using that O'Donnell & Willard underreamer [321] there at that time, when did you next use an O'Donnell & Willard reamer?

A. Well, I rather think that I went back there again and used the reamer; but I am not positive as to that.

(Testimony of Thomas A. O'Donnell.)

Q. 192. Do you remember of any other time using an O'Donnell & Willard reamer, after these two days that you refer to, until this 10-inch was made in 1908?

A. I can't recall that distinctly to my mind. I know that I did use the reamer out here in the local field, the 7 $\frac{5}{8}$, after it came back from up north; but to what extent I am unable to say, and in order to make my testimony regarding it effective in any way, it would be necessary for me to establish some dates or wells, which I can't do. In a general way, I know that I used it.

Q. 193. And what difficulties did you have in the use of that reamer?

A. We had the same difficulties in the use of that, getting down the hole; had to tie the knives and put the sticks in before we could do anything with it.

Q. 194. Approximately how much, all told, have you expended in connection with this O'Donnell & Willard experiment, Mr. O'Donnell?

A. Oh, I have had in my mind right along, probably not based on any figures at all, that it cost me about a thousand dollars—the patent and so forth. I have no correct statements of the cost.

Q. 195. Now, when was this two days that you tried to use this reamer at Newhall?

A. That was in the early part of 1901.

Q. 196. Can you tell us approximately when?

A. No; I cannot. I can tell you that it was within a month or two of that time. [322]

Q. 197. A month or two of what time?

(Testimony of Thomas A. O'Donnell.)

A. The first of the year.

Q. 198. To whom did you ever rent this reamer?

A. I have been unable to establish that definitely in my mind. Some people took it up around Newhall and used it, but I am unable to state definitely.

Q. 199. Have you any books or records which would show the rental of it?

A. No. Like a good many of the uneducated knockers around the field, I carried my books mostly in my pocket. To refresh my mind out loud, I can give some of my reasons for calling it to mind.

Q. 200. Well, what are those?

A. I sort of thought Arthur was rather enthused over the proposition and would like me to spend a little more money than I thought I was justified in doing, and this particular man around Newhall come telling me what a devil of a good reamer it was, and how much he had reamed with it, and it sounded a good deal to me like Arthur. I can remember the man very distinctly—I think if I should meet him on the street now I would know him—but at the same time I can't recall his name.

Q. 201. You didn't take much stock in what he said at that time?

A. Well, I didn't know whether he was telling the truth or not. He claimed he had reamed a great deal of hard rock up there and it was one of the best reamers he had ever seen.

Q. 202. And that was after your use of the reamer in Newhall?

(Testimony of Thomas A. O'Donnell.)

A. That was after my use of the $9\frac{5}{8}$. This is the $7\frac{5}{8}$ I am referring to. I had used the $7\frac{5}{8}$ quite a good deal around in the local field here and it always worked better than the one that Arthur made. [323]

It was in the early part of 1901 that we first used the O'Donnell & Willard underreamer. The $7\frac{5}{8}$ -inch underreamer—O'Donnell & Willard—worked better than the $9\frac{5}{8}$ one which we had in use at Newhall.

Am testifying in this case at the request of Mr. Wilson. I have had some conversation with Mr. Lehman and Mr. Blakeslee, also Mr. Wilson, perhaps others, in regard to this matter.

I am still the owner of a one-half interest in the O'Donnell & Willard patent.

Q. 212. Have any suggestions been made to you recently by any one that the Union Tool Company is infringing such patent in the manufacture of the Union or Double reamer? A. Yes.

Q. 213. By Mr. Blakeslee?

A. I don't know whether it was him or Arthur or Mr. Wilson.

Q. 214. You have talked that matter over, then, with one or more of them have you?

A. Yes.

Q. 215. And what was that conversation? [324]

A. Oh, it was kind of general. I have not—

Q. 216. What was said in that conversation in regard to the bringing of a suit on that patent?

Mr. BLAKESLEE.—Objected to as not cross-examination; and, in so far as it concerns the per-

(Testimony of Thomas A. O'Donnell.)

sonal interest of this witness in the O'Donnell & Willard patent and in any question of any infringement thereof, and in so far as any such talks were of a confidential nature, or were had in the sense of a discussion which might be considered as in the nature of advisory, formal or informal, witness is informed that he need not answer the question without the instruction of the Court. In such statement, I do not in any sense instruct the witness not to answer this question, but I merely notify him of his position in this matter and leave it to his own decision as to whether or not he wishes to answer the question.

Mr. LYON.—Read the question to the witness.

(Question No. 216 read to the witness by Special Examiner.)

Mr. BLAKESLEE.—You understand fully my remarks, Mr. O'Donnell?

A. Yes, I have nothing particular that I care to hide in connection with it. If they want to go into my personal affairs, they can go at it.

Q. 217. (By Mr. LYON.) Answer the question.

A. I was advised that I had some equities in the patent, if I cared for such a suit.

Q. 218. Is it not a fact that an effort was made by Mr. Willard to get you to bring, conjointly with him, such a suit?

A. No, sir; there was no such effort made, and it has not been talked seriously that I know of.

The Plotts underreamer operated quite as successfully as all the underreamers we had available

(Testimony of Thomas A. O'Donnell.)

at that time. That was between 1898 and 1902. We used it with a bit ahead of it. [325]

Q. 225. Did you get with this 10-inch O'Donnell & Willard reamer that was built in 1908 as good results as you got with either the $7\frac{5}{8}$ or $9\frac{5}{8}$?

A. No; I think not, because I didn't follow it up. I changed my mind after I went up there about experimenting with my own tools in companies where I was working for others. The $7\frac{5}{8}$ was used at a time when it was exclusively my own work and I was working in the derrick myself a great deal at that time.

Q. 227. When was the first time that you ever talked with Edward Double in regard to this O'Donnell & Willard reamer?

A. I don't know that I could recall the first time—if there is more than one, or two, or half a dozen, or whether I ever discussed it with him very much.

Q. 228. You remember discussing it with him, do you not?

A. Yes. He called to my attention the other day a conversation that he claims that I made to him, and I do recollect having a conversation along similar lines.

Q. 229. What was that conversation?

A. My recollection of it is—now, leading up to this point, I want to be particularly clear in there because I don't want to be misunderstood or question Mr. Double's remembrance of it. My recollection was that I called his attention to the fact that I had received a letter such as I had about the patent,

(Testimony of Thomas A. O'Donnell.)

and that brought up a general discussion and Double seemed to think that I was making or laying the foundation for—to attack his underreamer, and I told him I had no intention of doing anything of the kind, that I was playing my end of the game and he was playing his; he was in the manufacturing end and I monkeyed with the underreamer a little, and had had many difficulties in connection with it; he was a mechanic and—as more or less of a josh, as I remember it—had come along and took my ideas and made them mechanically perfect, and as long as he played the game fair I [326] would not interfere with him.

Q. 230. Is that all of that conversation that you remember?

A. That may not be the conversation at all. That is the trend of the conversation as I remember it. I could not, to save my life, give you the exact words of it.

Q. 231. Didn't you at that time tell Mr. Double that you had blown in a lot of money on that O'Donnell & Willard experiment trying to make something out of your ideas and the ideas of Mr. Willard but that you never had gotten anywhere to any successful result, or words to that effect?

A. Well, now, my remembrance is just what I am telling you about. That is pretty close to the conversation in connection with it. I don't see why I should at that time or at any time later give Mr. Double anything if I had it, and it was perfectly good will that we were talking, and general conver-

(Testimony of Thomas A. O'Donnell.)

sation—no bargain made for anything or anything given for any statements that I might make. It was merely a friendly conversation, started by me, as I remember it, in a josh, about this letter that I received in which some attorneys had told me that we had a patent to both of the reamers.

Q. 232. And the statement substantially as I have last made it is substantially as you remember the conversation?

A. No; I made the statement substantially as I have made it—substantially as I have made it so far as my recollection goes.

Q. 233. Then, will you answer whether or not you used the words I have indicated, or substantially those words, in that conversation?

A. I will say that I have no recollection that those are the substantial words.

Q. 234. Did you not tell Mr. Double in that conversation, in either direct words or words to the effect, that the experiments that you had carried on with what you have here termed the [327] O'Donnell & Willard underreamer had not proven anything to you and had not been sufficiently successful for you to say that the reamer was a success?

A. Well, you are going into a lot of words there. Of course my answer to that is that the general conversation was along the lines that I had spent money and was not interested at that time in building an underreamer and had no desire to stop him building it, or anything else. As far as I was concerned I considered he had made a mechanical success out

(Testimony of Thomas A. O'Donnell.)

of it and I would go ahead and buy his reamers—would not bother with it.

Q. 235. And at the same time you said he had made a mechanical success of it, didn't you state that you and Willard had not made a success of it?

A. Yes; sure, sure. I thought we had the principle all right there and if we had followed it up and carried out some of the details, it would have been all right.

Q. 236. As a matter of fact, neither you nor Mr. Willard, so far as you know, have ever carried out those details of that, have you?

A. No. We made those attempts during that time.

Q. 237. Then, summing it up, isn't it a fair statement, Mr. O'Donnell, to say that while you made these experiments with the O'Donnell & Willard reamer, you never yourself got that reamer to such a point that you considered it a practical or successful reamer?

A. The reamer, up until the time that Mr. Double and Mr. Wilson finally perfected their reamers, in my judgment, was as good as anything that was on the market at that time. The later mechanical perfections of them is far superior to that reamer—there is no question about that.

I have a distinct recollection of having made three O'Donnell & Willard reamers and I might have made another one—a $5\frac{5}{8}$. [328] —I do not know what has become of the other O'Donnell & Willard reamers. The occasion for building the 10-inch

(Testimony of Thomas A. O'Donnell.)

O'Donnell & Willard reamer at the Wilson & Willard Manufacturing Company's shop was: Merely Arthur Willard's request. He thought he had an idea that would eliminate some of the difficulties I had with it. Arthur Willard and I discussed these difficulties a good many times. We never built a reamer with the tripping mechanism shown in the O'Donnell & Willard patent. My idea of that is that it would be inoperative. Arthur thought it would work. My recollection is that I sent the first O'Donnell & Willard reamer, the 7 $\frac{5}{8}$, in 1901 from San Fernando, down to the Baker Iron Works to make some changes that Arthur had in mind, and then I changed my mind about it and took it out in the field and used it some, and then sent it back again to the Baker Iron Works, probably a year afterwards. That would be in 1902. After that nothing was done with it. I kind of dropped it. I don't know what became of it.

We had more or less trouble with all reamers in getting them into the casing so they will go down the hole, including the O'Donnell & Willard, the Double underreamer, and the Wilson reamer.

The principles of the O'Donnell and Willard underreamer and those of the Double underreamer are similar in many respects, although I think the Double reamer as it is constructed to-day does very much better work in getting it in and out of the hole. I would make the same comparison of the Wilson and the O'Donnell & Willard. I think both of them as constructed to-day are very complete reamers.

(Testimony of Thomas A. O'Donnell.)

STIPULATION.

It is hereby stipulated and agreed that the order book of the Baker Iron Works, November 1900, sales, shows the following order, the same being in the handwriting of Elihu C. Wilson, President [329] of the Wilson & Willard Manufacturing Company, and that the same be copied in the record of the Special Examiner, which is thereupon done as follows:

Order received.	Baker Iron Works,	Binder Folio 361.
Personally.	Los Angeles, Cal.	Date of Invoice.
Order No. Page.	Date, Oct. 29, 1900.	Nov. 21, 1900.
	Charge to Thos. O'Donnell.	(225 Hellman Block).
Salesman.	Ship to El Moro Oil Co.	Terms.
Alexander.	Whittier	212
Register Number	Ship via	Check
3856		C. L.
Filed By		Salesmen Must

	Shipper's Quantity.	If BO.		Salesmen Must
Shipped.	Check	Original	Note Price	Columns
Nov. 15, 1900.	G.	Number.	Register.	Total.
	1	9-5/8	Under Reamer as directed	
	56-1/4	hr. Forge	1.50	84.38
	91	" Lathe	.80	72.80
	27	" Fitting	.65	17.55
	76-1/2	" Helping	.40	30.60
	6#	Spring Steel	.07	.42
	20#	Norway Steel	.07	1.40
	85#	Cast Iron for Spe-		
		cial tool	.05	4.25
	1002#	Soft Steel of		
		9-1/2 #	.05	50.10
	306#	Hard Steel	12 1/2	38.25
				<hr/> 299.75

Testimony of William G. Lehman, for Defendant.

Mr. Lehman testifies as follows:

My name is William Grant Lehman; superintendent of oil property [330] at McKittrick. Age 48. I have been connected with the oil business since 1894. I am familiar with underreamers. I have used the old Austrian reamer, the Double reamer and the Plotts reamer. I have used the Willard reamer, and also the Wilson reamer. I used the Austrian reamer first in 1894 until about 1899. At the present time I am using Double underreamers. I have also had very successful use with the Wilson underreamer.

I used the Willard reamer in 1901 on the Alliance Oil Company's property near the mouth of the Newhall tunnel. Mr. O'Donnell was there part of the time it was being used. The reamer was a 9 $\frac{5}{8}$. That reamer is now in the shop of the Wilson Willard Manufacturing Company of this city. I used it on only the one hole at Newhall.

It is in identically the same condition, as my memory goes. My recollection of its use is not very clear but I remember that we had some trouble due to the sand gathering in behind the sleeve, and we had to wash it out every time we run it. That sleeve was built entirely too close—it fit the reamer body too closely. We had trouble in getting the reamer into the hole at times. We used a string or wire or something and tied the knives together before running it into the casing.

Q. 62. Now, tell us, please, about the use of this

(Testimony of William G. Lehman.)

Willard reamer up there in 1901—what you did with it?

A. Well, I can't remember but very little, only I know we used it with some success; also we had a great deal of trouble, too.

Q. 63. What was the—

A. On account of the sand getting in behind that sleeve.

Q. 64. Well, tell us, please, in obtaining the success you have referred to, how you used the reamer? Take your time and think, if you want to. There is no hurry.

A. In the ordinary way of using the reamer it was inserted in the hole and the knives was collapsed. In getting below the bottom of the pipe they would expand so as to enlarge the hole [331] for the casing.

Q. 65. Well, tell us about this enlarging, if you can, anything further, and what results you got.

A. In running below the pipe the knives would expand so as to drill the hole larger than the casing, allowing the casing to be lowered down.

Q. 66. How far, if you can remember, approximately, did you lower the casing this way?

A. I couldn't tell you. We had some success with it and some results, but how much I can't remember.

Q. 67. Do you remember anything about the kind of formations you encountered in this well?

A. Yes, we had some very hard formations. Some granite, some nigger-head, and some very soft shale.

(Testimony of William G. Lehman.)

Q. 68. On which of these formations did you use this Willard reamer? A. On the hard formation.

Q. 69. Do you remember how deep that well was, approximately?

A. That well was about 840 or 860 feet.

Q. 70. Do you remember whether it produced when you got through with it?

A. No; it didn't.

Q. 71. What can you say with regard to the formations in this well up there in comparison of them with other formations you have met in other parts of California?

A. The formation on top down to 300 feet was very hard. In fact, we had an anvil on the floor and the number of bits we dressed just wore the anvil until there was a hole right through it, we had so many bits to dress—a very hard formation.

We turned the anvil down, and there is a kind of lug on there that just worked itself through the floor. We had to dress—oh, any number of them; three or four a day. But after 300 the [332] formation was soft.

Q. 72. During how much of the drilling of this well, approximately, did you use this Willard reamer? A. But very little.

Q. 73. Well, I mean during what parts, during what stages of the drilling?

A. Why, it was hard, in the hard formation.

Q. 74. Did you use any other reamer on that well?

A. No; we did not.

Q. 75. How far did you get the casing down in that well?

(Testimony of William G. Lehman.)

A. I don't remember. We had three strings of pipe in there—we had $11\frac{5}{8}$, $9\frac{5}{8}$, $7\frac{5}{8}$.

Q. 76. Well, can you remember approximately how far you went with the casing? Very roughly—any way that you can safely put it.

A. We had somewhere about 150 feet of $11\frac{5}{8}$, and there was something over 300 feet of the $9\frac{5}{8}$, and then we had close to the bottom the $7\frac{5}{8}$.

I can fix the date as 1901 that we used that reamer at Newhall as I was married August 8, 1900 and I took my wife up there. I was there until the well was completed and we pulled it out and attempted to lower a larger-sized casing. I pulled everything out and got in a cavey formation. We attempted first to ream the hole without any casing in at all, and it caved so we could not do it, and we worked quite a while without any casing in, and then we got word to abandon the proposition. Never used it at any other time or place. We didn't use it enough to get much of an opinion on it. We didn't test it out very much. It would be impossible to ream some formations with the Austrian. It was not strongly built enough. I don't think that you could accomplish but very little with the Austrian reamer in the formation at Newhall. [333]

Q. 88. Did you at any time ever use any other Wilard underreamer, this is, built like this one?

A. I used one $7\frac{5}{8}$ and one 10-inch. The construction was a little different.

Q. 89. When and where did you use these?

A. I used one in the Los Angeles field on the

398 *Wilson & Willard Manufacturing Company*

(Testimony of William G. Lehman.)

Whittier Consolidated property.

Q. 90. When?

A. I couldn't say the exact year. It was later than '97.

Q. 91. Later than—

A. One thousand eight hundred and ninety-seven.

Q. 92. And what was the size of this reamer?

A. $75\frac{1}{8}$.

Q. 93. And how about this 10 inch?

A. That one I used in the Coalinga field. That would be along in '98 or '99.

Q. 94. Give the year in full please?

A. One thousand eight hundred and ninety-eight or one thousand eight hundred and ninety-nine.

Q. 95. Do you know where that reamer came from?

A. Yes. Mr. Willard delivered it to me on the lease, the Octave Oil Company's property.

Q. 96. Where were you just before you went up to that Coalinga property?

A. I was in the Los Angeles field.

Q. 97. And where were you before that?

A. I was in the Coalinga field before that, too. I was in the Coalinga field in '97.

Q. 98. What year?

A. One thousand eight hundred and ninety-seven.

Q. 99. And where were you after leaving Newhall? [334]

A. I was over at the Western Union Oil Company in the Santa Maria field. That was along during—I have got them dates wrong. I guess. I was in the

(Testimony of William G. Lehman.)

Santa Maria field along about '95 or '96. I was there a year and a half.

Q. 100. My question was where you were after you left Newhall in 1901?

A. In the Los Angeles field.

Q. 101. And after that?

A. I was in the Coalinga field after that.

Q. 102. What years or what year.

A. One thousand eight hundred and ninety-seven.

Q. 103. Well, you have testified you were in Newhall in 1901? A. Yes.

Q. 104. And now you say that after that you were in Coalinga in 1897?

A. No; that is wrong.

Q. 105. Will you please straighten out your dates, if you can remember.

A. I was in the Coalinga field in '97; I know that. And then in 1901 I was in the Newhall field—in '97 and '98 I was back in the Coalinga field.

Q. 106. Give the full numeral numbers of those years, please.

A. One thousand eight hundred and ninety-seven and one thousand eight hundred and ninety-eight.

Q. 107. That is four years before you were up at Newhall?

A. No; I am getting these—I was there before and after both.

Q. 108. Now, when were you there after? Take your time to think. I am not trying to rattle you. I am trying to find where you were and when?

(Testimony of William G. Lehman.)

A. I was in Coalinga field in '06 and '07. [335]

Q. 109. At any time after that?

A. Yes. Oh, there was a number of times. I can't just collect the dates right.

Q. 110. Well, now, let us get it clear. Which of these times, if you can remember, it was that you used this 10-inch reamer there?

A. Somewhere between 1907 and 1909. That was in the Coalinga field. I got the "97's" and "1907's" mixed.

Mr. BLAKESLEE.—(To the Special Examiner.) Just put that on there: "I got the '97's' and '1907's' mixed."

Q. 111. And did you use that 10-inch Willard reamer to any extent up there at that time?

A. I attempted to but the knives were so large I had trouble in entering the pipe and getting it down the hole. At that time I had a long string of 10-inch in and expected to shut the water off soon and I was afraid to take chances on using the reamer.

Q. 112. Did you ever use a Willard reamer after that? A. Yes.

Q. 113. And when and where?

A. I can't recall where it was.

Mr. BLAKESLEE.—You may inquire, Mr. Lyon.
Cross-examination.

(By Mr. LYON.)

Q. 114. When was it? A. How is that?

Q. 115. When was it? You say you can't recall where it was. Now, when was it that you used an-

(Testimony of William G. Lehman.)

other Willard reamer after this attempt to use this 10-inch in Coalinga?

A. I thought he said the Wilson. [336]

Q. 116. Oh, then you understood by your testimony that you were attempting to use the 10-inch reamer at Coalinga, that the question was directed not to the Willard reamer or the O'Donnell and the Willard reamer like the one that you say that you saw at the shop to-day but was addressed to the Wilson reamer? Is that it?

A. No; it was not the same reamer. It was another one. The one we used at Newhall was a 9 $\frac{5}{8}$, and this was a 10-inch at Coalinga. It was not the same reamer at all.

Q. 117. Yes, and then you referred to another Willard reamer, didn't you, and said you didn't recall where it was that you had used it, after using this 10-inch at Coalinga? A. Yes.

Q. 118. Now, when was it that you used that Willard reamer?

A. That was at the Circle Oil Company at Coalinga.

Q. 119. What size was that? A. 10-inch.

Q. 120. This same 10-inch reamer that you have been referring to?

A. No. The one I am referring to now was the Wilson underreamer.

Q. 121. I show you a copy of letters patent of the United States Number 762,458, dated June 14, 1904, and ask you if that is like the reamer that you have referred to as the Willard reamer?

(Testimony of William G. Lehman.)

A. This is like the one that I used on the Whittier Consolidated, the $75/8$.

Q. 122. And when was it that you used that on the Whittier Consolidated?

A. That was in—this is not exactly the same [337] as the one I used, that $75/8$ there. This wedge in the bottom is different.

Q. 123. Any other differences?

A. It had a trip on the side here on that one the same as this, that shoved this wedge down.

Q. 124. The trip that you refer to is referred to as Numbers 28 and 26 on the drawing of the patent which you now have in your hands, is it not?

A. Yes.

Q. 125. Now, approximately, when was it, Mr. Lehman, that you used this reamer on the Whittier Consolidated? A. It was in 1898 or 1899.

Q. 126. Where did you get that reamer?

A. I bought it from Arthur Willard.

Q. 127. And how did that operate?

A. There was some changes. It was not exactly like that one. The wedge is different in the bottom there.

Q. 128. In what respect was the wedge different?

A. Why, it was more in a V-shape than round.

Q. 129. And how did that reamer, the one that you have last been referring to and the one that you bought from Arthur Willard and that you say you used in the Whittier Consolidated, operate, so far as the result secured by its use was concerned? Did you have any difficulty with it in the hole?

(Testimony of William G. Lehman.)

A. Yes; I had some difficulty.

Q. 130. Can you state approximately what the character of the difficulty was?

A. The pin that was attached to that wedge got bent. We had some trouble with it.

Q. 131. And was that trouble in getting the reamer out of the hole? A. Yes. [338]

Q. 132. Who was working on the Whittier Consolidated well at that time with you?

A. I don't know. I don't remember now.

Q. 133. Thomas A. O'Donnell had nothing to do with it, did he?

A. He was not working on that one; no. I was working for him.

Q. 134. Was he out there at any time to see this Willard reamer at work on this Whittier Consolidated property? A. Not this one; no.

Q. 135. He had been out there at the Whittier Consolidated property, then, to see the other Willard or O'Donnell & Willard reamer operate, had he?

A. We didn't use the other one on that lease.

Q. 136. Where was the property of this Whittier Consolidated that you refer to located?

A. It is in the Los Angeles field, on Newhall street and at that time it was Ocean View avenue.

Q. 137. Here in the city of Los Angeles?

A. City of Los Angeles.

Q. 138. Is this Arthur Willard, from whom you bought this reamer which, as you say, was substantially like Patent 762,458, with the exception of the V-shape of the wedge, the same Arthur Willard that

(Testimony of William G. Lehman.)

you refer to as having been with you up at Newhall when you tried this $95/8$ reamer up there on the Alliance Oil Company well?

A. Yes; the same.

Q. 139. What other trouble did you have with this last style of Willard reamer besides the bending of this trip?

A. That was all the trouble we had.

Q. 140. What did you do with that reamer?

A. It was left on the property of the Whittier [339] Consolidated.

Q. 141. Did you abandon it there?

A. Which? The—

Q. 142. This last Willard reamer that we are speaking about.

A. We finished the well and had no more use for it, and it was left there with the balance of the tools, the last I remember of.

Q. 143. You don't know what became of it, then?

A. No; I do not.

Mr. LYON.—In connection with the testimony of this witness, complainants offer in evidence letters patent of the United States Number 762,458, dated June 14, 1904, as "Complainants' Exhibit Arthur Willard Patent of 1904."

Q. 144. Did you ever try any other of these Willard reamers like this last one we have been referring to at any other time? A. No; I did not.

Q. 145. Do you know what became of this 10-inch Willard reamer which you say you attempted to use at Coalinga?

(Testimony of William G. Lehman.)

A. My recollection was it was taken to Coalinga to the American Petroleum Oil Company.

Q. 146. Was Mr. O'Donnell present when you attempted to use it on the property of the Octave Oil Company? A. He was not.

Q. 147. Did you attempt to run it into the well-hole on the property of the Octave Oil Company more than one time? A. Yes.

Q. 148. How many times?

A. We worked with it there one whole day. We got it down the hole almost to the bottom where we wanted to ream, and then we pulled it out.

Q. 149. You did no underreaming, then, with it?

A. No; we did not. [340]

Q. 150. You don't know where that 10-inch O'Donnell and Willard reamer went to after it was delivered to the American Petroleum Company at Coalinga, do you? A. I do not.

Q. 151. Do you know anything about its subsequent history, or whether it was used at all?

A. No; I do not.

Q. 152. Did that 10-inch reamer differ from the 9⁵/₈-inch reamer that you used or attempted to use out at Newhall? A. Yes.

Q. 153. In what respects?

A. The knives were constructed a little different.

Q. 154. Can you describe in what way they were constructed different? A. They were wider.

Q. 155. In what part were they wider?

A. Wider on the bottom.

Q. 156. Any difference in the upper ends or shanks

(Testimony of William G. Lehman.)

of the knives or bits?

A. There was some difference, but I can't recall what it was in my mind.

Q. 157. Did you use on that 10-inch O'Donnell & Willard reamer the same kind of tripping device that was used on the $9\frac{5}{8}$ out at Newhall? A. No.

Q. 158. In what respect was that different?

A. There was no sleeve on it at all.

Q. 159. Well, was there any kind of tripping device on this 10-inch O'Donnell and Willard reamer that you tried at Coalinga? A. There was none.

Q. 160. Who worked with you on this well at Newhall? [341]

A. I had a number of men there. Fred Fish worked there for a while, but he only worked there on the last end of the well.

Q. 161. Do you remember the name of any man who worked there while you had this $9\frac{5}{8}$ -inch O'Donnell and Willard reamer there and when you were attempting its use?

A. I can't recall the names of any men.

Q. 162. While you were at this well at Newhall, who operated this $9\frac{5}{8}$ -inch O'Donnell and Willard reamer? A. I did.

Q. 163. If I understand correctly, it was brought out there by Mr. Arthur G. Willard? Is that right?

A. It was either brought out or sent out. I don't know whether he brought it or not, but he came along at that time when the reamer was first brought out.

Q. 164. And how long did he remain?

A. He was there for a part of one day.

(Testimony of William G. Lehman.)

Q. 165. Who else was present at that time?

A. The crew that was working on the well. I can't recall the names of them.

Q. 166. Was Mr. O'Donnell there at that time?

A. Not when Willard was there, to my recollection.

Q. 167. When did Mr. O'Donnell come after this 95/8-inch reamer was brought out to that Newhall well?

A. Why, Mr. O'Donnell was out there practically very few times. He made occasional trips out.

Q. 168. When did you first run this O'Donnell and Willard 95/8 into that Newhall well-hole? Immediately after its arrival? A. Soon afterward.

Q. 169. The same day?

A. I think so. We run it the day he was there—Mr. Willard was there. [342]

Q. 170. How much did you run it that day?

A. I couldn't say exactly. I rather think we attempted to use it before he came out.

Q. 171. You say, "We attempted to use it." Who do you mean? A. Myself and helper.

Q. 172. Mr. O'Donnell was not present at that time? A. Not at that time; no.

Q. 173. And when did Mr. O'Donnell first see that 95/8 at Newhall?

A. Why, he was there sometimes after it arrived. I don't know just the time.

Q. 174. He was not there while Arthur Willard was there, then? A. Not to my recollection.

Q. 175. Did Mr. O'Donnell himself run that 95/8

(Testimony of William G. Lehman.)

reamer into the Alliance well-hole and superintend its running for several days.

A. He was there when we was running it. How long he was there I can't remember.

The Plotts underreamer I used was on the O'Donnell Oil Company property. We used it several times. It was a $7\frac{5}{8}$ and a $9\frac{5}{8}$. I used a $7\frac{5}{8}$ and a $9\frac{5}{8}$.

We used it with the drilling bit below it. We used a very short stub bit, in the neighborhood of four feet long. We used the bit in front of the Plotts' reamer because we thought it was necessary, to act as a guide. That is also the way we used the Austrian reamer. [343]

I think the first Double underreamer I used was on the Western Union Oil Company property at Santa Maria. That was along in 1905 or 1906.

We dressed the bits or cutters of the $9\frac{5}{8}$ O'Donnell & Willard underreamer while using it at Newhall. Dressed them several times. The reason we stopped the $9\frac{5}{8}$ casing where we did in the Newhall well at the time of running the O'Donnell & Willard reamer was that we got a showing of oil at that place and did not desire to carry the $9\frac{5}{8}$ casing any farther. We could have carried it farther with the O'Donnell reamer if we had desired to.

Q. 221. You are acquainted with Mr. B. W. Youngken, who is now here in the room, are you not?

A. I am.

Q. 222. And you have met Mr. Thomas J. Griffin?

A. I have.

(Testimony of William G. Lehman.)

Q. 223. You had some conversation with both of these gentlemen on about November 17, 1912, on the property of the Bellridge Oil Company in Kern County, California, respecting this O'Donnell and Willard reamer, did you not? A. I did.

Q. 224. And subsequently to that, and on or about the 30th day of November, 1912, or December 1, 1912, you had a conversation with Mr. Youngken in the presence of Mr. E. H. Williams, the superintendent of the Union Tool Company's shop at Taft, at this Bellridge property, in Kern County, in regard to this same underreamer, did you not? A. I did.

Q. 225. Was there any person present during that conversation?

A. Why, Mr. Johnston was present at that time.

Q. 226. What Mr. Johnston?

A. Mr. W. H. Johnston.

Q. 227. Who is Mr. W. H. Johnston? [344]

A. He is a driller in my employ.

Q. 228. How long has he been in your employ?

A. On the Bellridge property about six months.

Q. 229. How long have you known him?

A. I have known him for eighteen or twenty years.

Q. 230. Do you know him well enough to know whether he is a reliable man and generally states the truth? A. Yes, sir.

Q. 231. Does he? A. He does.

Q. 232. How did Mr. Johnston come to take part in that conversation that day?

A. I invited him to meet Mr. Youngken.

Q. 233. For what purpose?

(Testimony of William G. Lehman.)

A. To talk over this underreamer.

Q. 234. What does Mr. Johnston know about it?

A. In this conversation at that time he did not know much about it, only hearsay.

Q. 235. What did he say at that time?

A. We was trying to fix a date that reamer was used in the Whittier field. He said he knew of it being used there although he hadn't used it himself.

Q. 236. And he stated at that time, did he not, that the reamer was stuck in the hole and they spent two or three days, as he remembered, jarring it loose, and that if he had his diary or record book with him, which he had in Los Angeles, he could tell exactly how long it took to get it out. Is not that the conversation in that regard?

A. That is what he said.

Mr. BLAKESLEE.—We object to all this line of examination as to what this man Johnston had to say, as it was a conversation not in the presence of the parties to this suit, and if defendant wishes [345] to take the testimony of this man Johnston, let him appear at the proper time and testify, and then we will deal with his case as may seem proper after hearing his story.

Q. 237. (By Mr. LYON.) And it is a fact, is it not, that you told Mr. Youngken, in the presence of Mr. Williams, that Mr. Johnston could probably tell him all about it as he, Johnston, was the first one to run the reamer?

A. Now, those words are not right, I didn't say he was the first one to run the reamer.

(Testimony of William G. Lehman.)

Q. 238. What did you say?

A. I said he knew about as much about it as I did. I thought at that time he had used it himself on the Fidelity.

Q. 239. And in a subsequent conversation that ensued you found that it was the Elmora?

A. Yes. And, further, he never worked on the Elmora at all. It was a lapse of memory, he told me afterwards.

Mr. LYON.—We move to strike from the record and exclude from consideration all the part of the answer of the witness including and following the words, “And further,” on the the ground that it is not responsive to the question, and hearsay, the purpose of the present interrogation as to this conversation being for the purpose of impeachment of this witness and not with relation solely to what was actually done with the O'Donnell and Willard reamer.

Q. 240. Did you not state in this conversation that you first used this reamer on the Whittier Consolidated lease? A. Which reamer?

Q. 241. The O'Donnell and Willard reamer.

A. I said I had used one there on the Whittier Consolidated. Not the first time.

Q. 242. Did you not in that conversation state that you didn't remember whether there were any changes whatever made on [346] the reamer before it was sent to Newhall?

A. There was nothing said about that that I remember.

Q. 243. You state positively that you didn't say to Mr. Youngken, in the presence of Mr. Williams,

(Testimony of William G. Lehman.)

that you did not remember whether there were any changes made in this O'Donnell and Willard reamer before it was sent to Newhall?

A. Mr. Williams didn't hear all the conversation.

Q. 244. Will you state positively that you didn't make the statement last referred to to Mr. Youngken at the time referred to?

A. I don't remember doing so.

Q. 245. Will you state that you did not say it?

A. I did not say it.

Q. 246. And is it not also true that in this conversation to which we have last referred you stated that you thought Mr. Willard was at the Newhall well, but you were not positive of it? A. Yes.

Q. 247. Now, since coming to Los Angeles you have had a talk with Mr. Willard in regard to this matter, have you not? A. To a certain extent; yes.

Q. 248. And have discussed his being at the well at Newhall with him?

A. That was possibly mentioned in the conversation.

Q. 249. Well, it was mentioned, wasn't it?

A. Yes.

Q. 250. And he, Mr. A. G. Willard, told you that he was there, did he not?

Mr. BLAKESLEE.—Objected to, on the ground that any statement made to the witness by anybody else must come to us directly on the record, not indirectly through this witness.

Q. 251. (By Mr. LYON.) Read the question to the witness.

(Testimony of William G. Lehman.)

(Question No. 250 read to the witness by the Special Examiner.) [347]

A. He did.

Q. 252. Did you discuss with Mr. A. G. Willard whether Mr. O'Donnell, and I mean Thomas A. O'Donnell, was at the well at Newhall while Mr. A. G. Willard was there? A. We did not discuss it.

Q. 253. You had some conversation to-day, in this office, in which you and Tom O'Donnell took part, and which was a discussion of this O'Donnell and Willard reamer and this Newhall use of it, did you not? A. We did.

The reason that after running this 10-inch O'Donnell & Willard reamer into the well hole on the Octave property at Coalinga I withdrew it from the casing without underreaming was I had a long string of pipe in there and I was getting ready to shut off the water, and I didn't want to take chances on getting a tool stuck in the hole, because we had to move the casing every few minutes to keep it from freezing up.

Redirect Examination.

(By Mr. BLAKESLEE.)

Q. 262. This Willard reamer you have testified about as using up at the Consolidated property at Whittier and having a wedge in it, which, as I remember, you said you moved up and down, was used before or after you used the O'Donnell and Willard reamer up at Newhall?

A. This Whittier Consolidated property was here in the Los Angeles field; not at Whittier. We drove

(Testimony of William G. Lehman.)

a well at Whittier, the Whittier Consolidated, and then we took some other property in here.

Q. 263. (By Mr. LYON.) But you didn't use the Willard reamer at Whittier, California? [348]

A. No; no.

Q. 264. (By Mr. BLAKESLEE.) Now, when was this used? Before or after you were at Newhall?

A. In my testimony before I made some mistakes in the dates. I testified that I used that on the Whittier Consolidated in 1900 and 1898 or '9; and I used that one after I used that at Newhall.

Q. 265. Now, can you remember what year it was?

A. It was somewhere between 1902 and '4 somewhere.

Q. 266. When Mr. Youngken came to you, about the 1st of December, as I remember it, up at McKittrick,—McKittrick, wasn't it? A. Bellridge.

Q. 267. Up at Bellridge, at the Bellridge property, how was the conversation opened up with him?

A. Why, they asked me if I remembered the circumstance of using that underreamer in the Newhall field. I was not sure in my mind—had practically forgotten it—and he asked me to try to refresh my memory, when he come along again, and let him know; also asked me if Mr. Willard was there when I ran the reamer, and I told him I was not sure, but I thought he did, that he was there at the time.

Q. 268. And how long had it been before since you had thought over these Newhall happenings?

A. I had not thought of it for years.

Q. 269. And after Mr. Youngken came up and

(Testimony of William G. Lehman.)

kindly suggested that you refresh your memory, did you think them over and refresh your memory?

A. I did.

Recross-examination.

(By Mr. LYON.)

Q. 272. Mr. Lehman, Mr. Youngken was out to see you at the [349] Bellridge property once with Mr. Thomas J. Griffin, was he not? A. He was.

Q. 273. And then he came later and interviewed you a second time, and had in his company at that time Mr. Williams? A. He did.

Q. 274. Now, was it not at this first interview that this suggestion was made that you refresh your recollection? A. It was made at both interviews.

Q. 275. And was not the suggestion first made by Mr. Thomas J. Griffin? A. It was.

Q. 276. And Mr. Youngken came back the second time to see you to see what further you had been able to recall in regard to it? A. He did.

Mr. LYON.—That is all.

Testimony of Arthur G. Willard, for Defendant.

I am acquainted with William Grant Lehman who has testified in this case two days ago. He was at the shop of the Wilson & Willard Mfg. Co. at Los Angeles. He was there to inspect the underreamer in evidence as "Defendant's Exhibit O'Donnell & Willard Underreamer." I called Mr. Lehman's attention to that reamer. I told him, "There is the old O'Donnell & Willard reamer that you run up in the tunnel." And he immediately recognized it by the slidable collar at the top of the reamer, and stated

(Testimony of Arthur G. Willard.)

that that is where he had the trouble with it. Complainants' Exhibit "A," Willard U. S. Patent No. 762,458 was granted to me. I commenced experimenting with an underreamer like that described in this exhibit in April, 1903. I made a wooden model and applied for a patent, then entered an order with the Baker Iron Works for the manufacture of 55/8, afterwards a 75/8, and later on a 10". They were all completed. William Grant Lehman [350] used one of these reamers. Charlie Alexander paid the expense of making these three reamers and the expense of securing the patent for one-half interest in the invention. I wrote Mr. Lehman a letter to Bakersfield, which he finally received at the Bellridge Oil Company, and in his answer he stated he did not remember using the O'Donnell & Willard underreamer at the Newhall Tunnel, but he did remember using this 75/8 underreamer with the wedge action, and I took Mr. Lehman to the shop for the purpose of identifying the O'Donnell & Willard underreamer, as I testified that he had run this underreamer at the Newhall Tunnel. Mr. Lehman came down to the Wilson & Willard Manufacturing Company's shop and I took him out and showed him Defendant's Exhibit O'Donnell & Willard Underreamer. I talked with him regarding its use at Newhall and in regard to how it worked. I also talked with him in regard to the 10-inch O'Donnell & Willard reamer that was built in 1908 at the Wilson & Willard Mfg. Co.'s shop. Prior to the time that Tom O'Donnell testified in this case I talked with

(Testimony of E. C. Wilson.)

him in regard to the alleged use of the O'Donnell & Willard underreamer at Newhall and also in regard to the 10-inch O'Donnell & Willard reamer.

I have talked with Mr. Thos. O'Donnell relative to the advisability of bringing a suit on the O'Donnell & Willard patent. I called Mr. Blakeslee's attention to that possibility, that the Double reamer was infringing the O'Donnell & Willard patent.

**Testimony of E. C. Wilson, for Defendant
(Recalled).**

While I was working for the Baker Iron Works of this city I made up the charge number 3856 appearing on the books of the Baker Iron Works, which is a charge covering the manufacture of one of the O'Donnell & Willard reamers. I also made up the charge, namely, entered the cost cards and material cards against the order, aggregated the amount of time and material, and total to charge.
[351]

Cross-examination (E. C. WILSON).

I have been interested in the underreamer business for the past nine or ten years. I am acquainted with the efforts of various companies to manufacture an underreamer which would be successful and which would not infringe the patents now in existence. For instance the Oil Well Supply Company has made an exhaustive research of the state of the underreamer art and have a report on same. I saw that report and according to it they were narrowed down to a pretty small field of invention in order to make an underreamer which would be successful and avoid

418 *Wilson & Willard Manufacturing Company*

(Testimony of E. C. Wilson.)

the patents now in existence. The Wilson underreamer patent particularly was mentioned as one which would be an obstacle which would be difficult for them to surmount. The Double underreamer patent was also mentioned and also the O'Donnell & Willard patent, was also considered reamer patents which would be difficult for them to circumvent.

We, the Wilson & Willard Manufacturing Company, sell our Wilson underreamers to the Oil Well Supply Co. The reamers which they had made up after their own design, and I believe were not even tried out.

In regard to the comparative selling facilities of the Union Tool Company, and our company will say that the Union Tool Company have a very extensive selling organization. Furthermore, special discounts they have allowed the California National Supply Company, the J. F. Lucey Oil Well Supply Company, The Union Well Supply Company, and two or three other houses doing general Oil Well Tool and Supply business has been the reason for those firms selling Double underreamers in preference to the Wilson reamer. Naturally their sales of the Union Tool Company reamers or Double reamers are very much in excess of those of the Wilson underreamer. At the time I first commenced selling Wilson underreamers, the Oil Well Supply Companies, namely, the different firms such as the California National Supply Company, Fairbanks- [352] Morse & Co., The J. F. Lucey Company, and others were receiving a discount of 10% on the Double

(Testimony of E. C. Wilson.)

reamers and were selling them at list. I allowed them the same discount and did not for a long time ascertain that secretly Double was allowing them a discount of 15% off the list. This is a special discount to which I refer and which was the occasion for their selling Double underreamers in preference to the Wilson reamers. It was not until 1909 or 1910 that I changed my discount from 10% to 15% to the supply houses.

I have always used the same price list that Mr. Double has used, selling my reamers to the consumer at the same price he established. Hence I say the discount of 15% to the supply houses which Double was allowing, was .05% better than I was allowing them. Therefore, from the years 1905 until probably 1909 or '10, it was naturally to their interest to sell Double reamers in preference to Wilson reamers.

Concerning the special discount, will say that the practice of the Union Tool Company in giving special discounts to the supply houses was so general that each supply house seems to feel that the other fellow is getting some special discount or some special privilege that he himself is not enjoying. I have heard one or two houses complain that they believed they were not getting a fair deal from Double in the way of discounts. That they believed other houses were getting a better discount than they.

Testimony of A. G. Willard, for Defendant.

The 7 $\frac{5}{8}$ " Willard & O'Donnell underreamer used successfully by Mr. Thomas O'Donnell did not have the locking device on it as set forth in the O'Donnell & Willard patent. We did not think it was necessary. We never used it. [353]

STIPULATION.

By Mr. LYON.—It is stipulated and agreed, in view of the testimony of A. G. Willard, that the William G. Lehman, in his testimony given in this case Saturday night, December 21, 1912, in referring to a 9 $\frac{5}{8}$ " O'Donnell & Willard underreamer as seen by him in the shop of the Wilson & Willard Manufacturing Company that they in company with A. G. Willard, referred to the underreamer heretofore offered in evidence by defendant as the "Defendant's Exhibit O'Donnell & Willard."

**Testimony of W. W. Wilson, for Defendant
(Recalled).**

By Mr. BLAKESLEE.—The small brass model referred to is offered in evidence as "Defendant's Exhibit Small Brass Model of Wilson Patented Underreamer."

The brass model of the Wilson underreamer was manufactured by the Wilson & Willard Manufacturing Company and was made as nearly as possible to conform in design and construction to the drawings shown in the patent of the Wilson underreamer.

Further in regard to the brass model of the Double underreamer will say that it was made to conform

(Testimony of W. W. Wilson.)

as nearly as possible to the Double underreamer patent. Since that model was made, however, I have noted a few differences between this model and the patent drawings, namely, the lower set of dovetails on the cutters at present in this model which are not present in the patent "Complainants' Exhibit Double Underreamer Patent."

By Mr. BLAKESLEE.—We offer in evidence the small brass model last referred to, as "Defendant's Exhibit Small Brass Model of Double's Patented [354] Underreamer" (with lower dovetails added).

By Mr. LYON.—It is stipulated that the photograph last referred to by the witness is a photograph taken in July, 1909, at a well being drilled in Whittier field by Allen Craig, the equipment having been furnished by the Union Tool Company, and containing the calf-wheel arrangement the subject of the Craig and Double patent, differing from the earlier calf wheels in instrumentalities which were immaterial in this case. The photograph was taken of a drilling rig in which the bull rope was a manila line and the casing line and drilling line a wire rope or cable. The pipe or casing shown in the photograph in the well operating was a 11 $\frac{5}{8}$ " casing, and had been lowered to a depth of about 1800 feet at that time the photograph was taken. And it is stipulated that the manila rope lying in a coil underneath the driven portion of the calf wheel is an extra bull rope. The photograph shows the bull rope on the bull wheel, and the drilling line extending up on the drum of the bull wheel to the top of the derrick, and is by this

(Testimony of W. W. Wilson.)

means that the bit shown in the photograph as protruding into the well casing is suspended. And this photograph was produced by counsel for complainants at the request of defendant, and shows a Union reamer in the derrick.

By Mr. BLAKESLEE.—The photograph last referred to is offered in evidence as “Defendant’s Exhibit Photograph of California Oil Well Rig, Showing Calf Wheel, Bull Wheel, Wire Rope and Top of Casing in Hole, the Casing Shown Being Heavy Casing Weighing not Less Than 54 Lbs. to the Foot.”

Q. 500. What can you say further with respect to these reamer parts?

Mr. LYON.—Of your own knowledge.

A. This is the lower half of a Double underreamer body. [355] A part of the cutter-shank of one of the cutters is shown within the body, the lower end of the dovetail portions of the body being bent inwardly as though striking down on some hard substance, the lower portion of the hollow-slotted extension having been worn and refaced with plates to take up the wear at this point, these plates having been set into recesses machined in the lower end of the partition for their reception. The upper portion of the other cutter is shown herein; however, the small burr on the corner of the dovetail portion of the body was broken off by myself and the foreman of the Wilson & Willard Manufacturing Company in getting the part of the cutter out of the body.

This body was obtained in a scrap heap on the Salt Lake oil fields property, an addition to the city of

(Testimony of W. W. Wilson.)

Los Angeles. This is a broken part of what remains of a Double improved underreamer. I obtained this broken body and broken cutters about a month ago. I have no personal knowledge as to any use of these parts or how they came to be in this condition.

(The reamer parts just discussed by witness are offered in evidence as "Defendant's Exhibit Parts of Broken Improved Underreamer.")

Testimony of Arthur G. Willard, Recalled, at the Request of Counsel for Complainants.

I was present at the lease of the Central Oil Company while they were attempting to remove the 7 $\frac{5}{8}$ " Willard underreamer which had been stuck in the casing, but not an O'Donnell & Willard underreamer. The reamer which was stuck in the casing was substantially like that shown in "Complainant's Exhibit A. Willard U. S. Patent #762,458."

I cannot say that it was the Alliance Oil Well where the O'Donnell & Willard reamer was used near Newhall. I know that [356] William Lehman was the driller in charge and that he was working for Tom O'Donnell. Mr. O'Donnell was not there while I was there. I did not meet Fred Fish there that I know of. The only man I remember is Lehman.

The bar which I have here was the Tee-Bar for Wilson underreamer. A Tee-bar similar to that was used in the Wilson underreamer some time prior to the year 1907. It has also been used between the year 1908 and '10. This bar is used in connection with a block in the reamer body which is held in place

424 *Wilson & Willard Manufacturing Company*

(Testimony of Arthur G. Willard.)

with set-screws. The purpose of the block is to hold the spring in place in the body.

The Tee-bar differs in form from the present construction in that the present Tee-bar used in the Wilson reamer is slotted as in the "Complainant's Exhibit Wilson Underreamer, #2."

By Mr. LYON.—The Tee-bar referred to by the witness offered in evidence as "Complainant's Exhibit Wilson Spring-Actuated Rod and Retaining Block." The slotted Tee-bar is more convenient for the operator in assembling the Wilson underreamer. [357]

Testimony of H. G. Bailey, Witness on Behalf of Complainant.

Mr. Bailey deposes and testifies as follows:

My name is H. G. Bailey; residence, Whittier; occupation, oil driller; age, 32. Have worked on the Whittier crude oil property and the Almore properties in Whittier. The Elmore Oil Company operated on my grandfather's property.

I was employed on the Elmore lease as a tool dresser in about 1901. I met Tom O'Donnell at the Elmore well. They brought an underreamer out there to try, Mr. O'Donnell, I don't know who was with him; I think it was Dick Harris, though, manager of the oil company. They tried to run that reamer. We got the reamer down to the bottom of the hole and throwed a rope and tried to find the bottom of the casing, and the reamer stuck in the bottom of the casing; tried that several times and knocked

(Testimony of H. G. Bailey.)

it loose, and it would stick in the shoe every time you pull up against it. Mr. O'Donnell said, "Pull it out; won't run it; it will have to be fixed." We got it out of the hole. About a day getting it out of the hole. We loaded it on to a cart and brought it down to the Whittier Crude lease and left it there. I don't know what became of it. It took about a day to get it out of the El Moro well hole. It would stick at every joint of the casing, almost every joint; especially those joints that was not screwed together tight, the cutters would stick; have to hitch on and jar it up through there. This reamer was not actually used to underream at the El Moro well. It was never returned to the El Moro property after it was carted down to the Whittier Crude lease. I know it was carted down to the Whittier Crude lease. There was a heavy rain come up the day we was running the reamer, and washed out the road. The other tool dresser and myself put the reamer on a cart and pulled it down by hand, down to the Whittier Crude lease; it would be about a mile. They wanted it pulled down there so they could load it into a wagon. [358]. Have never seen that reamer since until to-day. No one pointed it out to me. I knew it. (Witness identifies Defendant's Exhibit O'Donnell & Willard Underreamer). The reason I have such a clear recollection of this happening is that the land belonged to my grandfather, and he wanted me to go up there and kind of look after the well, and see that everything was all right; that was one reason I

(Testimony of H. G. Bailey.)

was up there as tool dresser on that well.

I have been drilling oil wells about three years. Was tool dresser prior to that time.

I never saw a reamer like the Canadian 4½" reamer here on the floor marked "Defendant's Exhibit Oil Well Supply Company of Canada 4½" underreamer. I would not run it in that shape. It would break the cutters off on a hard shell. (Witness is shown "Defendant's Exhibit Sample of Swan Reamer" and asked if he ever saw a device like it before). I don't remember that reamer.

Q. 65. Please look again at "Defendant's Exhibit Swan Underreamer" and see if you find any such dovetails as that on that exhibit.

Mr. LYON.—The question is objected to as not cross-examination, and as incompetent, the witness having testified that he does not remember ever having before seen a reamer like the one referred to.

A. There is something similar.

Q. 66. (By Mr. BLAKESLEE.) And they keep the cutters from escaping sideways, don't they?

A. Yes; could not escape sideways without they break the pin; come clear down and fall out. (Witness in last portion of his answer refers to Double underreamer.)

Q. 67. And those dovetails in the Swan exhibit confine the cutters to their movements lengthwise of the body at the bottom, don't they? [359]

Mr. LYON.—All questions relating to this Swan reamer are objected to upon the same grounds stated

(Testimony of H. G. Bailey.)

in the objection to the first question on cross-examination referring to the Swan reamer, and it will be understood that such objection need not be repeated.

A. Yes, sir.

Q. 68. (By Mr. BLAKESLEE.) In the bottom of this Swan underreamer body there is a longitudinal slot, is there not? A. Yes, sir.

The Canadian underreamer would have to have dovetails like the Swan or the Double, in order to hold the cutters in it.

I have known Double underreamers sticking in the casing. We generally tie the cutters with a string. Most any reamer of that type does stick if the cutters are not tied down. I don't remember how long we had the Double underreamer or the O'Donnell & Willard underreamer in the hole. It would stick against the shoe when we attempted to draw it into the casing. I don't remember about it whether it was dropped on the shell or not. I don't know whether it was on a shell or not. We did not try to ream with it at all, we did not hitch it on to the [360] beam. I was not there all the time it was in the hole. Probably two minutes at a time I would be at the boiler sixty feet away.

At present I am working for the Canadian Pacific and they are using Double underreamers. I have never used a Wilson underreamer.

Testimony of S. S. Frampton, Called on Behalf of Complainant.

Mr. Frampton testifies as follows:

I am 49 years old; occupation driller, residence

(Testimony of S. S. Frampton.)

Whittier, California. Have been in the drilling business over twelve years. I am familiar with underreamers and have used the Plotts underreamer, the Double underreamer, the Wilson underreamer and I have tried to use the North reamer and also the Leidecker underreamer.

I tried to use the Leidecker underreamer in the Whittier Field the first time in about 1903. We had trouble to get it down into the hole and consequently did not run it any more. It seemed as though the cutters did not move, and the reamer worked up and down on the cutters. In trying to get the reamer out of the well hole it stuck, and we had to jar it, it would stick in the casing. Have to jar it loose; jar it up; keep pulling it and jarring it, to get it out. I presume we worked at it three or four hours. After we got it out we throwed it on the ground and give it a good cussing. It was not practical to run it. "Defendant's Exhibit Sample of Swan Reamer" is like the one we used.

At about the same time we tried to use the North underreamer but found it would not stand up to hard reaming. The reaming we had to do was very hard—unusually hard. We used it one or two days and practically spoiled it, the bottom of it. We horsed it out the same as we did the Leidecker. We had to jar [361] it and jerk it to pull it out.

The next reamer we tried was the Double. We had a very hard shell, and we was using the Plotts underreamer, and had been working for a week with it up there trying to ream, and we could not seem to

(Testimony of S. S. Frampton.)

make much headway with the reamer. Got a Double and it done the reaming, and we kept the reamer. Have used the Double reamer more or less ever since. Have never broken off a Double reamer cutter. Have used them a great deal, more than any other, I believe.

I have used the Wilson reamer in the Whittier field and also in Ventura county. We had fairly good success with it. Spoiled the reamer; we wore the reamer out; it did not seem to stand the hard usage. We did not finish the well with the Wilson reamer. Finished it with a Double reamer. Did not have any trouble with the Double reamer. Have had the bottom bolts of Wilson reamers bend, trying to get the reamers into the casing. We had trouble with the bolt (bottom bolt) coming out. Never lost any Wilson cutters. Never lost cutters of any kind.

After running a $7\frac{5}{8}$ " Wilson underreamer, reaming about 400 feet with it, we sent it to the shop to be re-machined. Cut back or fixed up. We lost some of the safety bolts of the Wilson underreamer and the bottom of the reamer would then spread.

I have worked for the Central Oil Company,—about four years ago. They used the Double and the Wilson reamers.

When I first came to California we used the Plotts underreamer. It was the only practical reamer at that time, and we had nothing else to ream with except that, and we used that. We had fairly good success with it. It was slow, but we got our reaming

(Testimony of S. S. Frampton.)

done with it. We run very easy; just as easy as we possibly could run on it.

I was on the El Moro property when O'Donnell brought that reamer out to be tried. He came to our well at one time and asked if we wanted to try it. We did not care about trying an underreamer [362] which other people had had trouble with as they had on the El Moro. We would not try it. At that time we were contracting for the Whittier Crude Oil Company. The O'Donnell reamer was brought down from the El Moro and throwed off on our lease. It was not brought to us. Defendant's Exhibit O'Donnell & Willard reamer'' looks like it. I refused to attempt to use it, because of what I had heard in regard to its use at El Moro.

I would not run an underreamer like the Canadian underreamer as I would consider it dangerous to run into a hard shell, you would break the cutters off or have trouble with it. It is not a practical tool to run, if the cutters are made in that manner, in hard formations that we have to work in California. I would tell them to get somebody else to run it. We have used the Plotts underreamer without using the bits with it, that is without having the bits connected to it. The Plotts reamer may be used in the Whittier field yet, I do not know. The Plotts reamer would do the work if you would give it time enough.

The body of the Wilson reamer would not last as long as the body of the Double, because the cutters come loose, and the bottom bolt coming out of the bottom, giving trouble where the Double did not.

(Testimony of S. S. Frampton.)

The Wilson underreamers which are re-machined work just the same as a new Wilson reamer.

I have never had the dovetails of a Double reamer break. They wear of course. I have never had any trouble with jumping the pin at the joint with the body of the Double reamer.

The Canadian underreamer differs from the Double in a number of ways, the cutters being made different and they are held in a different way. The spreading part would be practically the same. [363]

But there is nothing to retain your cutters or to strengthen the cutters from bending and giving you trouble in getting them out of the hole. This could not be remedied by shortening the cutter in this Canadian reamer. You would have the same trouble. In running on anything hard you would bend the cutters. The bending could be prevented to a certain extent if you put on dovetails, but you would have trouble then with the end of your cutters, the block the hole is in would jam back against there; you would eventually break that off, I would judge, or damage it in such a way that it would not work, with hard usage.

The dovetails in the Swan underreamer and the Double are the same. In drilling one must keep the tools on a tight line. You cannot run them on a slack line.

I prefer the Double underreamer having the wide cutters to the old style Double which had the narrow cutters. The wider cutters of a Double reamer hold

(Testimony of S. S. Frampton.)

better than the old cutters used to.

I have not seen any Double underreamers with narrow cutters lately. No. I never saw a Wilson underreamer with cutters as narrow as the old style Double. No, I don't think I ever saw broad cutters of the Double underreamer until after the Wilson reamer came out.

I do not think the Day underreamer would be a practical underreamer.

We didn't use the Plotts reamer any more after we got the Double. I have run the Double harder than I have the Wilson for the simple reason that when I ran the Wilson reamer so hard I lost the bottom pin out, the bolt in the bottom. I have tied the cutters or bits of both the Double and Wilson reamers. Sometimes the bits get wore and they won't go down the casing and catch in the joints and give trouble and stick, and by tying them they go down and won't stick. This wear is on the spreading [364] surfaces and on the sides of the bits, the shanks of the bits. This first Double reamer I used was like "Defendant's Exhibit Double Underreamer." When we first got this Double reamer we had two Plotts reamers, they were comparatively new and in good running order. We never used them after we got the Double. The term "finding the bottom of the casing" in well drilling parlance means you have to find the bottom of your casing to tell where to hitch on to start your reamer when you start to reaming. You practically have got to know where your casing is to know where you want to

(Testimony of S. S. Frampton.)

ream. So you find the bottom of your casing before you hitch the reamer on to the walking beam. To find the bottom of the casing, we throw on the rope and run the reamer down and back to try to find where the reamer enters the casing. Sometimes we can't tell exactly, and we hitch on where we think the bottom is, and invariably the jar of the reamer coming in will tell us where it is. We pull the reamer back into the casing until the bits strike the casing for collapsing. I don't know as there is very much advantage with the broader cutters, in the Double improved reamers. There would naturally be a little less danger of keyseating. I never saw a Wilson cutters broken at the shank. (Shown "Defendant's Exhibit Small Working Model of Day Device.") There are several reasons why I don't think that would be practical. The fact is, I can't see how that could be made to work at all with safety. With the Swan reamer, if the reamer was dropped through and on to the shell and the end of the reamer struck portions of the shell you would spoil your reamer. You would spoil those dovetails. You would drive them in till your cutters wouldn't pull down. Such an injury is not possible with either the Double or the Wilson reamers. I do not know of any company, except the company with which Mr. Plotts himself is personally connected and one of the [365] managing officers of that is using the Plotts reamer.

In reaming you are liable to strike the corners of the bits as well as any other part of it. This would

throw the full force of the blow on the corner. It would throw it in a twist or sidewise movement.

**Testimony of Claude Crawford, Witness Called in
Behalf of Complainants.**

Testifies as follows:

My residence is Whittier, California, I am connected with the oil business. Have been in the oil business about 13 or 14 years. I am a driller for the Central Oil Company. The Central Oil Company is using Double and Wilson reamers. It has been a little over a year since we used the last Wilson. I broke the mandrel of a 10-inch Wilson when jarring the cutters into the shoe. The part of the mandrel that broke was something similar to that marked "Complainant's Exhibit Broken Wilson Reamer Mandrel or T-Rod" the way it is broken there. I lost one cutter in the hole, drilled it up, succeeded in fishing out the other cutter. The Double reamer will stand more grief than the Wilson. I cannot tell you exactly why. I think that extra offset on it, for one thing, is about all.

I think the Double underreamer will stand more work than the Wilson reamer. The reason is on account of the extra offset on it. That is about all.

(Complainants offer in evidence the mandrel referred to by witness and ask that same be marked "Complainant's Exhibit Broken Wilson Reamer Mandrel or Tee-rod.")

I have had experience with steel as a blacksmith and know that when steel is overheated it is burned. It makes it more brittle after having been burned. I

(Testimony of Claude Crawford.)

would not state [366] whether the metal in the broken mandrel was overheated or not. I do not remember the year the mandrel was broken. Do not remember how long we had used it. Don't remember where we procured that Tee. No, sir. That is the only breakage to Wilson underreamer I ever had. I have had broken Double underreamer cutters break while in use. They broke in the offset. We broke three sets of Double cutters inside of a month. I think the Double underreamer stands up better than the Wilson reamer but I guess my reason for thinking so is a matter of personal prejudice.

I have seen Plotts reamers used on the Murply Oil Company's property. I have never used any narrow cutters of Double reamers. The Double underreamers I have always used is the type having the wide cutters like the Wilson. I prefer the broad cutters. The broad cutters have more cutting surface. The drillers on the Central Oil Company's property have nothing to do with taking care of the tools after they get through drilling with them.

Testimony of T. M. Frampton, for Complainants.

Mr. Frampton testifies as follows:

I am a driller, been engaged in oil well drilling in California for 15 years. I am acquainted with the man by the name of North. I used one of his reamers, or tried it. It was in 1901 or 1902. It was 55/8". We were drilling a well for Mr. Off in the Whittier Field. It was an old well that they had tried to drill

(Testimony of T. M. Frampton.)

and got it plugged up. We were using a Plotts underreamer at that time. At the suggestion of Charles Off, we tried a North underreamer for two or three days. "We didn't have no success with it, and practically wore the thing out—that was about the size of it." North sent a bill for \$60 for rental. I had made no arrangements with him, the arrangements [367] were made with Mr. Off. He sent me another bill and I paid no more attention to it and I recollect right that ended the thing. And I never paid him anything for the rental. I now remember that Mr. North sent out a reamer and sent out instructions how to use it.

He called me up after I got running the reamer and gave me instructions how to run the reamer. If I recollect right he said the reamer should be run in the second hole at thirty strokes a minute.

The next well we drilled on we adopted the Double reamer. It was the first one I ever saw. It was not the style we use to-day. It worked very successfully. The Plotts reamer is a very slow reaming reamer and its a reamer that won't stand any grief, and I found the Double reamer done the kind of work we wanted to do with the reamer—we could get some satisfaction out of it, and in all my work after I first used the first reamer I used nothing else but the Double reamer after that—that is for my own use when I was contracting. Prior to the time I got the first Double reamer there was a demand for a successful reamer.

I have used Wilson reamers. The Central Oil Company use about half Double's and half Wilson's. The Wilson reamer cannot stand up to hard reaming

(Testimony of T. M. Frampton.)

like the Double reamer can. They won't "stand the racket." We run the Double reamers right along the same as we drill and you can't do that with the Wilson.

There is nothing to support the Wilson cutters. We most always tie the cutters of the Double underreamer and the Wilson underreamer together. We do that because they go down the hole so much nicer anyhow. But after you wear cutters a certain length of time they get so that you have to tie them. That is occasioned more from the back becoming worn. By backs I mean the portion which strikes the casing when the reamer is in the casing. [368] The only experience I ever had with the Swan reamer was, I ran one into a hole and could not get it out. I worked practically my whole tower trying to get it out. A tower is twelve hours. My brother got it out but I could not do it. I have seen other men run Swan underreamers though. They had about the same success I had with it.

I have used Wilson underreamers that have been machined back.

The question of preference between the original or old-style Double and the Double improved with wider cutters, is a good deal just a matter of prejudice and opinion. I had just as good success with the first Double reamer as the last one, so far as reaming was concerned.

I like the new style or wide cutters of the Double underreamer a little better than the old ones. I have not run any of the old style Double underreamers for

(Testimony of T. M. Frampton.)

six years. I have seen them. I see them every day. They have them. They have them there, they will use and do use when they have that size holes to run with. They are the odd-sized reamers. The reamers the Central Oil Company now purchase are the later type with broad cutters.

The North underreamer was not a practical underreamer in my estimation.

Q. 68. Now, what was the trouble with the North reamer, back to 1901 or 1902?

A. Well, there was not very much of anything about it that was any good, to my estimation. There was a very good idea about it but it didn't seem to ever work out practically.

Q. 69. Perhaps was not made the right dimensions, I suppose?

A. Yes; that part of it was all right. And it was more of an experiment, then, but one great trouble was getting the [369] cutters in and out, at that time, that we had with it, and after you got them down the hole they were hard to get out, and they were hard to get down.

You could not tie the cutters of the north reamer, as I recollect it. It has been a good while ago. No, you could not tie the cutters of the North reamer—I know you could not—because the cutters haven't anything to do with going down the hole in the North reamer as I used it.

I ran the first Plotts' underreamer that was ever made. That was in 1897. It is not a practical reamer. It is too slow. Oh, yes, it reams. You can

(Testimony of T. M. Frampton.)

get casing down if you can get time enough, but, to my knowledge there is none of them being run at the present time. I know that the Murphy Oil Company, on the Plotts property, is running the Double reamer at the present time. All the wells I have been to lately are running the Double reamer. I don't know that that is the only reamer. I do not think that the fact that there is no "sub" in the Wilson reamer as there is in the Double is an advantage.

Q. 95. How do you explain it that, as you say, the Wilson reamer won't stand up as well as the Double reamer?

A. Well, there is not anything at the bottom of the cutters. You understand what I mean?—that, when you are reaming, the whole pressure of your cutters is in at the bottom, and the Wilson reamer is hollow there; there is only two little places on each edge for the cutters to go against, while, the Double reamer, you have the solid body; the reamer sets solid, the cutters set solid against something.

Q. 96. You say you have never had any breaks of cutters?

A. The cutters don't break, but it wears the reamer so fast you can't get your hole large enough for the reamer.

Q. 97. Where does it wear?

A. On the bottom, where the cutters set against the [370] reamer. There is where the Wilson reamer won't stand the racket that the Double will.

Q. 98. You mean to say that the metal breaks down at this point?

(Testimony of T. M. Frampton.)

A. It wears; the cutters, working in it, wear out in a little while or no time. That is the reason they have to cut them back.

Q. 99. Did you ever have to scrap a Wilson reamer because of this wear? A. What is that?

Q. 100. Did you ever have to scrap a Wilson reamer because of this wear—throw it in the scrap heap?

A. Oh, I don't know. They have a lot of them out at the scrap-heap. They make sockets out of them.

Q. 101. And Doubles, I suppose, also?

A. Yes, sir.

Q. 102. I mean, have you ever, to your knowledge, to your recollection, had to throw a Wilson in the scrap heap because it wore in the body?

A. Yes, sir; lots of them out there. I don't know what they do with them, but they take them away.

Q. 103. That was after a long period of wear, was it not?

A. Not very long. We have one Wilson at the present time that the bottom of it is practically wore out and we didn't ream over one hundred and fifty feet with it. Of course the reaming was very hard.

Q. 104. You have Double reamers give out, I suppose, after exceptionally hard work, also?

A. Oh, they will wear out; yes.

The difference between the Wilson underreamer and the Double is that one is open at the end and the other is solid at the end. [371]

Q. 117. (By Mr. LYON.) You say the cutting of

(Testimony of T. M. Frampton.)

the bottom of the Wilson reamer out so that it has no central bridge between the ends of the body of the reamer weakens it. Now, comparing simply the mode of securing the expansion of the two reamer bits and the way in which the bits work, what difference, if any, in your opinion, is there between the Double and the Wilson reamers in that regard.

A. Well, the only difference is the construction of the cutters. The cutters are, you might say, two different styles of cutters altogether. One pulls up and expands from the bottom of the reamer and the other expands from the make of the cutter.

Recross-examination.

(By Mr. BLAKESLEE.)

Q. 125. In the Wilson reamer it is the cutters themselves that give the extension, is it not? That is, the expanded bearing surface on the cutters acts upon the forks at the lower end of the body?

A. That expands it?

Q. 126. Yes.

A. Well, I don't see how the cutters have anything to do with the spreading of it. In my opinion it is all in the bottom of the reamer that causes the spreading.

Q. 127. What I mean is, it is the bottom of the reamer, in connection with its side extension or bearings that causes the expanding? A. Yes.

Q. 128. And in the Double reamer it is the inner faces of the cutters acting upon the solid lower end of the body that causes the expansion, is it not?

A. Yes, sir; something which is pulled over.

(Testimony of T. M. Frampton.)

Q. 129. In other words, it is the action of a wedge interposed between the bodies of the cutters in the Double reamer?

A. No, the wedge is there, and in order for the— Well, I hardly know how to explain that myself. The cutters being—one expanding from the shape of the cutters—you see the cutter drops under in the one reamer, and the other it slides down on it. [372]

Q. 130. In the Wilson the cutters slide down and close in together, do they not? [373]

A. Yes.

Q. 131. Whereas, in the Double?

A. They slide down and hook over.

Q. 132. They slide down and hook under the wedge-shaped bottom of the body? A. Yes.

Q. 133. And there are projections on the inner faces of the Double cutters? A. Yes.

Q. 134. That hook in under, are there not?

A. Yes.

Q. 135. And there are no such projections on the Wilson cutter? A. Not on the inner side.

“I am acquainted with Tom O'Donnell, of Los Angeles. He had an underreamer that he tried on a well that was drilled for—I guess he was perhaps interested in the company—on the El Moro. I was not there and seen the reamer used but only know what I was told. It was just prior to the time that I had the experience with the North reamer. The circumstances were these: I saw them bringing the O'Donnell reamer away from there, and they had had a lot of trouble with it, getting it out of the hole,

(Testimony of C. L. Keiser.)

I guess. At least that is what they told me. They went up there and brought it down past my well where I was working; and I went out and looked at the reamer, and I was very anxious to see a reamer with the cutters in the bottom. That was the first reamer I ever saw that the cutters worked in the bottom. And from what I knew and what I talked with the boys, I was acquainted with them all, they said they had had a great deal of trouble with it up there. It was Moranville and Bailey had it on a buggy. Moranville is dead. Bailey's full name is Hibben Bailey. I know it was at the time I was working on the first well for Mr. Off, 1900, 1901." [374]

Testimony of C. L. Keiser, for Complainants (In Rebuttal).

Mr. Kesier, called as a witness on behalf of complainants in rebuttal, testified as follows:

I live Whittier, California. My business at present is ranching. I have been connected with oil well drilling—was a driller. Have operated in the Whittier field for the Central Oil Company and the Fidelity Oil Co. I am familiar with underreamers and have used them. Have used the Double underreamer, the Wilson underreamer, the Plotts and the Leidecker. I just tried to use the Swan or Leidecker. It was not a success with me. It never did any cutting to amount to anything. I attempted to use it several times. [375]

It wouldn't work. The cutters would not work. I attempted to use it several times—I don't know how many times. I have used the Plotts under-

(Testimony of C. L. Keiser.)

reamer some. Not very much. Have not used the Wilson very much. I like the Double reamer the best.

I have lost cutters off of Double underreamers, yes. I expect three or four on the four inch or four and a half Double. In trying to straighten a crooked hole I have knocked them off. We got a shoulder and we got to drilling before we knew it. That is the only way I knew it. There is nobody can look down the hole and see; but that is my opinion. I know that when we started to drilling we had to drill instead of clean out.

Have used the Plotts reamer in several holes. It was very poor success, that is, as far as fastness was concerned. It will ream the hole but it takes a long while to do it—that is if it is not too hard. We never had very much success with the Plotts reamer but where the Plotts reamer is used and the rock is not so hard they get along with it very well, but in hard rock we never had any success with the Plotts reamer. We used the old style Double reamers on the Fidelity and Central. We used both styles.

I like the new style Double underreamer the best because it is the strongest. The body is stronger and the cutters are stronger.

Testimony of Louis Teatsorth, for Complainants.

Mr. Teatsorth testifies as follows:

I live here in Los Angeles. I am a well driller. I have worked in Orcutt, California. I attempted to use the so-called North Improved Underreamer. I secured that underreamer from Mr. Youngken.

(Testimony of Louis Teatsorth.)

He was with the Union Tool Company. [376]

Well, we were drilling several wells, and were short of reamers on Hobbs No. 6—8 $\frac{1}{4}$ —so I went and saw Youngken and asked him if he would give me a Union Tool reamer. He said he hadn't any in stock at the present time but he had an improved North reamer and he thought they had improved on them so it was going to be very satisfactory and he recommended the reamer to me to try. I took the reamer and run it in the hole. I think the hole was about 2,200 feet. Got it down to the bottom, pulled up to find the shoe and we pulled up the shoe. We worked about eighteen hours trying to work the reamer up into the casing but never succeeded in getting it back into the shoe. So we had to pull the casing in order to get the reamer out. When we recovered the reamer we found that the T-head had been bent over to one side. One lug was hanging down and the other was virtually up. We never done anything only we run it to the bottom, run it to the shoulder where we were supposed to start to ream, and pulled it back up to find the shoe in order to know that we were right. Well, we never could get it back up into the shoe.

After we got this North improved reamer out, I reported to Mr. Youngken the condition, the trouble we had had with the reamer and the condition the reamer was in when we pulled it out of the hole. I could not account for the bending of the pin that held the cutters. I have explained as near as I can the condition of the reamer when we pulled it out; that

(Testimony of Louis Teatsorth.)

T-bolt was pulled over down at one side; one of the lugs was down and the other was up. We worked there about eighteen hours trying to pull it into the shoe. Did not try the reamer after that.

That reamer was like the reamer shown in "Defendant's Exhibit Union Oil Tool Company circular of North Improved Underreamer."

I think that was in 1905 or '06.

They gave us a Double reamer in place of it.
[377]

Testimony of George L. Case, for Complainants.

Mr. Case testifies as follows:

My name is George L. Case; I live on Florence Ave., Hollywood. I am connected with the Amalgamated Oil Company at present. Am a well driller. I am drilling in the Salt Lake field at the present time. We have Double reamers there. We also have the Wilson reamers there.

In the Salt Lake field at present we are using the Double reamer. At first we used the Double. After that the Wilson. The company still has a full set or string of Wilsons of the various sizes. The reason for the use by the Amalgamated Oil Company or Salt Lake Oil Company of California in the Salt Lake field, of the Double reamers and the nonuse of the Wilson reamers now, is the Wilson reamer could not stand the work. The bolt on the bottom was always breaking with them. In case the spring or anything would break you would lose the inside working of the reamer by it. I have known of the Wilson reamers breaking while in use in the Salt

(Testimony of George L. Case.)

Lake field. The bolt would break and when you go to put in another bolt you would find the bottom sprung out so you could not get the bolt in. I notice there is a slight spring outward of the bottom end of the Wilson reamer "Complainant's Exhibit Wilson Underreamer No. 2." When the Wilson reamer springs out like that we cannot get our other bolt in. The bolts break right in here, any place between the end there, the center. Occasionally I have had the cutters or lugs of the Wilson reamer break; also those of the Double; we never keep track of those so I cannot say whether we broke more Wilson or Double cutters. The spreading of the bottom was the greatest fault of the Wilson reamer. We always figured that it was this spreading of the bottom that caused the bolt to break. They wouldn't break unless that was spread. I always laid that to the strain of the prongs. It appeared that [378] the action on the shell spread the prongs out.

When the bolt breaks the bottom would spring out so you could not get the bolt in. It gave no trouble in withdrawing the reamer into the casing shoe.

I prefer the Double underreamer because it has always given better satisfaction.

The last time I saw the Wilson reamer the bolt was broken.

I would not call the Canadian underreamer shown by model a practical device. I would not care to run the Canadian underreamer. I do not like the lugs, they are too long. They are too weak also. The Wilson and the Double are the only reamers I have

(Testimony of George L. Case.)

ever used. My knowledge is limited to those reamers. I have seen Austrian underreamers but have never used them.

The safety bolt of the Wilson underreamer has nothing to do with spreading its cutters.

The only trouble the spreading of the reamer body caused when the safety bolt broke out was that we could not put a new safety bolt in it while the lugs or forks were spread apart. The prongs would be spread only about half the thickness of the bolt. Never enough spread to cause trouble to withdraw the reamer into the casing.

A reamer like "Defendant's Exhibit Small Working Model of Day Device" would have too much side motion; there is nothing to keep it from working to the side. The cutters would thrust against the bottom at the lower end but in turning the reamer would bind the cutters. The cutters are free, that is the objection. The cutters spread by tilting over wedge-like formation between them. It may ream in certain kinds of reaming but I would hate to run it.

With the reamer shown in "Oil Well Supply Company's Limited of Canada's catalogue 41½" reamer the thrust of the cutters is taken up at the upper end. The cutters are spread and contracted over the lower end of the body. The cutters are too long, [379] that is the trouble. There is nothing to keep the cutters from working side wise. I guess that is about all. The purpose of the bottom bolt of the Wilson underreamer is to strengthen the reamer.

(Testimony of George L. Case.)

In my experience with the Double and Wilson reamers I [380] have never found that the casing would follow one better than the other.

**Testimony of John S. Culver, Called on Behalf of
Complainants (in Rebuttal).**

Mr. Culver testifies as follows:

I reside in Whittier; my business is drilling. Have been in the business since 1900. I have drilled in the Whittier Field, in the Coalinga field and in the Midway field. At Whittier I worked for the Central Oil Co. I am familiar with underreamers and have used them. I have used the Austrian underreamer, the Plotts underreamer, the Double underreamer and the Wilson underreamer. Also have tried to use the Swan underreamer. We had trouble to get the Swan underreamer down in the hole, and out of the hole. We did not accomplish much with it. We put in most of our time, when we were using it, getting it out and in the hole—trying to use it.

The Austrian underreamer did the work if you could give them time enough, and the same can be said of the Plotts reamer. I consider the Double reamer or the Wilson reamer either better than the Plotts or the Austrian. I had a little trouble with the Wilson underreamer in getting the hole large enough for the casing to go through. That was the only trouble I had with it. I had an old Austrian underreamer set over and I finished the hole with the Austrian underreamer. I reamed the shell with that Austrian reamer. They had no Double reamer

(Testimony of John S. Culver.)

that we could get hold of and they had an Austrian so we took it. As to the relative strength of the Double underreamer and the Wilson underreamer I don't know that I have tested their strength. From what experience I had had I have thought that the Double would stand a little the most.

The Double has been my preference since I have been using them. I don't know that I prefer it any more than I like the reamer the best. [381]

The Double seemed to do the work and I had less trouble with it. I never had any trouble with the "sub" or middle joint of the Double reamer.

I have been able to ream the hole a little larger with the Double than with the Wilson.

We ran the Austrian underreamer just the same as any other reamer.

We broke a great many cutters of the Austrian reamer and had different kinds of trouble. Sometimes they would wear and not lock. They were not strong enough.

I like the new style of Double reamers namely, the Improved underreamer better than I do the old style. It is a little stronger reamer, has a little more bearing surface underneath the cutters and that of course is due to broadening of the cutters. I think we had more trouble with the old style Double reamer cutters than we had with their improved style. I think the broader cutters with their bearings against the lower end of the body gives a better bracing action or relation. I have broken Double underreamer cutters.

**Testimony of James Kramer, Called on Behalf of
Complainants.**

Testifies as follows:

I live in Los Angeles, Blacksmith by occupation. Am at present employed by the Salt Lake Oil Company. I worked for the Wilson & Willard Mfg. Company in about the year 1911. Was with them for about six months, employed as a blacksmith. While I was there I think I saw one Wilson & Willard underreamer which was broken at the end. (Witness points to the point below the thrust bearings and contained the thrust bearings, and just in line with or above the bottom bolt of the Wilson reamer.) I do not know how that Reamer was broken. I have seen them in the oil fields [382] that were broken.

Q. 36. Where was it that you saw the other Wilson & Willard reamer bodies that were broken?

A. Around the shop there. I don't remember just where they were, but they were laying in the shop.

Q. 37. Do you mean to say that you saw others that were broken clear across at the lower end?

A. Out in the Salt Lake oil fields.

Q. 38. How many did you see of that sort?

A. I don't know. I didn't just count how many.

Q. 39. Do you know when the breaks occurred?

A. No; I didn't know when they occurred.

Q. 40. Did you see the breaks? A. Yes, sir.

Q. 41. Did you see them just after they occurred?

A. I don't know how long it was after they had occurred that I saw them.

(Testimony of James Kramer.)

Q. 42. Have you any knowledge of how the breaks occurred? A. No; I do not.

Q. 43. Do you know where any of these broken Wilson reamer bodies you have referred to are now?

A. No, sir.

The broken tee-rod of the Wilson reamer is "Jumped" that is in making the tee-rod you take a piece of steel or iron and jump those pieces on. You weld those pieces on, yes, sir. Comparing the Wilson tee-rod with the mandrel of "Complainant's Exhibit Double Underreamer" would be the stronger. My reasons for saying that is when you heat the tee-head of the Wilson reamer you take the carbon out of it and you don't know—you might get it too hot, or not hot enough. You may get a good weld on the outside but you don't know what you have on the inside. I never saw any of the Spring Actuated rods welded in the Wilson & Willard [383] Mfg. Company's Shop. As a matter of fact, when I was working there, they always forged these tee-rods. The tee-head was forged in one piece. They would draw them out under the hammer. I don't know how the broken reamer body I saw on the Salt Lake fields occurred.

I don't think it weakens the construction of the Double reamer rod to slot it through for the purpose of placing the key in it.

Forging the Wilson Tee-Head would be less expensive than to weld them on.

The more you forge a piece of steel the less carbon there is in it and it makes it that much poorer. I

(Testimony of James Kramer.)

haven't had very much experience in metal working. I don't know how much carbon there is in any steel. I never made any tests. I am not familiar with and don't know anything about Bessemer processes of refining iron. While working at the Wilson & Willard Shop I welded up rods and worked around the furnace.

I don't know how the Wilson reamer bodies were broken.

Testimony of William Williamson, Called on Behalf of Complainants.

Mr. Williamson testifies as follows:

I reside in the city of Los Angeles. Am an Oil Well Driller. Have been drilling for about twenty years. Came to California in about 1900. Am familiar with underreamers and have used them. The first underreamer I used was an Austrian underreamer. I cannot recall what trouble I had with it or what success. The next reamer I used was the Double. That was in 1902. I did the work with it I had to do. It was successful; yes, sir. I have used the Double reamer on and off ever since.

I also have used the Wilson reamer. I think I have tied [384] the cutters of both reamers. In the large sized reamers the spring is very stiff and the reamer goes down better with the cutters tied. I usually tie them anyway rather than have the trouble getting them through the pipe. I don't believe there is much difference in the sized hole the Wilson or Double reamer cuts. I once have broken

(Testimony of William Williamson.)

Double underreamer cutters. I broke one end of the key, and lost one cutter. That was the old style Double reamer.

I believe the Double reamer is the strongest as a whole.

I believe the dovetails in the Double reamer is the stronger. The cutters of the reamers contract and expand in the same manner.

The latest or improved style of Double underreamer is supposed to be the stronger reamer. On account of the dovetail seats. (Witness points to V-shaped groove at the bottom of Complainant's Exhibit Double Underreamer, or each side thereof.) The knives or cutters are heavier also. You can do better work with the later improved Double reamer for the reason that you can run it harder.

I would hate to run a reamer like the Canadian underreamer. Not knowing the contraction and expansion of those knives it would be hard for me to give you the reason. I would not consider it had expansion enough. I would not consider that it had near the strength of the Wilson or Double reamer has. I would not consider the Day underreamer a practical underreamer. I believe that in running this reamer you were running in blue shale it would be very hard to get the reamer back into the pipe again. That is, in reaming blue shale.

The extra width of the body or bearings underneath the V-shaped dovetails at the lower end of the Double improved underreamer body is an advantage, it enables the use of a stronger cutter and gives more

(Testimony of William Williamson.)

stock to the cutters or knives, hence they will last longer. I don't believe there is any better results secured in use [385] by the broadened cutter of the Double improved reamer over the old type Double.

There is more stock in the dovetails of the Wilson underreamer body than there is in the Double. That would make the dovetails stronger.

Q. 74. Then please reconsider the question with the following explanation, namely: That by tilting I mean that action which permits or causes the cutters to move into or out of contracted position.

A. I don't believe there is any difference between the two underreamers.

Q. 75. Then, do I take it that you mean to imply that there is a portion of the body directly between the bodies of the cutters in the Wilson underreamer exhibited, over which the bodies of the cutters move or play in expanding or contracting?

A. They both expand and contract the same, as far as I can see.

Q. 76. In the "Complainants' Exhibit Wilson Underreamer," the lower end of the body is bifurcated, is it not, or composed of two straight parts between which there is simply an open space? A. Yes.

Q. 77. Then, there is nothing at that part of the cutters to bear on, is there? That is, where it is open?

A. When the underreamer is in use there is no bearing there.

Q. 78. And there is nothing there that the cutters

(Testimony of William Williamson.)

bear on, is there? A. No, sir.

Q. 79. And in the Double underreamer, as for instance in "Complainants' Exhibit Double Underreamer," there is a combination metallic formation, is there not, across the bottom, in connection with which the bodies of the cutters work?

A. Yes, sir. [386]

Q. 80. Do you find in the Wilson cutters any such formation as the formation in the inner or working face of the shanks of the Double cutters in the form of a cut with an abrupt shoulder which engages with the lower end of the body of the reamer in the contracting and expanding action?

A. There is on the Double.

Q. 81. Do you find it on the Wilson cutter?

A. I don't believe there is on the Wilson cutter.

Redirect Examination.

(By Mr. LYON.)

Q. 82. What is it, Mr. Williamson, that is utilized in the cutter of the Wilson underreamer to cause the bits to ride out on the spreading-surface?

A. I don't believe I understand that question.

Q. 83. You have stated that there is no shoulder like the shoulder on the Double cutter. Now, what is there that causes the Wilson cutter to move outward when pulled up in the reamer?

A. The shoulders are in a different place on the cutters.

Q. 84. And how do they act?

A. Practically the same thing.

(Testimony of William Williamson.)

Recross-examination.

(By Mr. BLAKESLEE.)

Q. 85. The shoulders on the Wilson cutters or lugs which you have just referred to act upon the prongs or side portions or spaced side portions at the lower end of the Wilson underreamer, do they not?

A. Yes, sir. [387]

Testimony of E. C. Wilson (Continued), for Complainants.

Being subpoenaed as a witness for the Complainants.

The method of contracting and expanding the cutters is substantially the same in "Complainant's Exhibit Double Underreamer" and in the device of "Defendant's Exhibit Wilson Patent." I misunderstood the question. I understood that Mr. Lyon was asking me to make a comparison of the expansion of the cutters of "Complainants' Exhibit Double Underreamer" with the Double underreamer patent. The mode of expansion and contraction of the Double underreamer cutters as shown in "Complainants' Exhibit Double Underreamer" differs very materially from the mode of expansion and contraction of the cutter of the Wilson underreamer patent.

As I understand the term "mode of operation" it might be said to be the same, when comparing the two devices intended to perform the same duty, such as a LeFever shotgun, or a Parker shotgun, or a Smith shotgun. The mode of operation is exactly the same but the devices employed in those differ-

(Testimony of E. C. Wilson.)

ent guns to perform that operation or to perform the results obtained by the mode of operation, may be entirely different and each one in themselves patentable. I consider there is a difference between the "principle of action" and the "mode of operation." The Wilson patent as shown and described therein embodies a different "principle of action" of the parts in expansion and contraction of the bits or cutters on "Complainant's Exhibit Double Underreamers."

Q. 914. Then, do you understand, and testify, from your mechanical knowledge, that the extension of the spreading-surface of "Complainants' Exhibit Double Underreamer" to the periphery of the body, and the corresponding extension of the expanding shoulders of the bits to bear there against, involves the same mode of operation as in "Defendant's Exhibit Wilson Underreamer Patent," so far as the expansion and contraction of the bits are concerned? [388]

A. The mode of operation, namely, the acts or forces required, and which must be applied to the cutters to expand or contract them—I mean those forces employed which are in nowise any part of the reamer itself—is not changed by the change in design occasioned by extending the spreading-bearings to the periphery of the body. That principle is old; it has been used on various underreamers long before Mr. Double ever employed it.

Mr. LYON.—Complainants move to strike from the answer and exclude from consideration that por-

(Testimony of E. C. Wilson.)

tion of the answer beginning with and following the words, "That principle is old," on the ground that it is not responsive to the question, and not the best evidence, and incompetent.

Q. 915. What forces, in your last answer, or acts, do you refer to as not being in anyway any part of the reamer itself.

A. I mean the forces that are employed to draw the cutters downwardly overcoming the tension of the spring so that they will collapse over the end of the hollow slotted extension.

Q. 916. Now, so far as the underreamer, "Complainant's Exhibit Double Underreamer" is concerned, in its mechanical embodiment, and the device described and shown in "Defendants' Exhibit Wilson Underreamer Patent," is concerned, from your understanding of mechanics do you understand that the extension of the spreading-surface of "Complainant's Exhibit Double Underreamer" to the periphery and the corresponding extension of the expanding shoulders of the bits thereof to bear there against involve the same mode of operation, or do they involve a different mode of operation?

A. The same mode of operation will collapse the cutters or expand them to reaming position.

Q. 917. Based upon your knowledge of mechanics, does this extension of the spreading-surface of "Complainants' Exhibit Double Underreamer" to the periphery and the corresponding extension of the expanding shoulders of the bits thereof to bear there against, [389] involve the same principle of ac-

(Testimony of E. C. Wilson.)

tion in the expansion and contraction of the bits or cutters as is involved in the device shown and described in "Defendants' Exhibit Wilson Underreamer Patent"?

A. There is a different principle of action.

Q. 918. In what does that different principle of action consist, in your opinion?

A. Well, that question will require considerable time to answer. It has been answered two or three times before, and at considerable length.

Q. 919. You should be capable of a concise answer; and, will you please give it, so that we may know exactly what you have in mind after a complete study of the matter?

A. The means employed to expand the cutters of the Double underreamer—either Complainants' Exhibit or Defendants' Exhibit Double Underreamer—consist of three main features: First, is the stationary wall or partition, so placed on the reamer body itself, and integral with the body, that it forms a wedge or a spreading-bearing between the cutters. The faces of this stationary wall are parallel, that is, the bearing-faces or the opposite faces on which the cutters rest when in expanded position. The cutters themselves have V-shaped grooves planed across the backs of the cutters, and which grooves are necessary in order to permit the cutters to collapse over this stationary wall or partition, or hollow slotted extension, as it is repeatedly termed in the Double underreamer patent. In addition to the tilting action or collapsing action of the cutters, namely, the

(Testimony of E. C. Wilson.)

action produced by swinging the cutting end of the cutters toward each other as the cutters are collapsed over the spreading-bearing of the reamer body when the cutters are drawn down sufficiently for them to slide over and below the lower end of the hollow slotted extension, there is an additional means employed to enable them to collapse and also to assist in expanding them, and that is due to the upwardly and inwardly [390] inclined grooves, which form pockets to engage the shanks of the cutters. By reason of these pockets being at an angle with the vertical line of the reamer body, the angle being inwardly and upwardly, the cutters are obliged to follow the trend of these R. 1036 grooves when being drawn downwardly to collapse the same, or when being drawn upwardly by the power of the spring when expanding them to reaming position. Now, the combination of the wedge-like action of the hollow slotted extension, also by reason of the beveled face on the projection or shoulder on the inner faces of the cutters, which projection or shoulder is produced by the V-shaped grooves planed across the backs of the cutters, also by the additional action or force occasioned by the angularly planed grooves or channels in which the cutters travel, all together produce the contraction and expansion principles of action of the Double underreamer in both defendant's and complainant's exhibits. In other words, there are means on the cutters themselves, and also on the bodies, the combination of which means produce the action. To obtain this action it is necessary for the

(Testimony of E. C. Wilson.)

cutter to teeter during the time of its collapsion or expansion. When the cutters are being collapsed the upper end of the cutter, namely, all of that portion of the cutter which is above the point of contact on the spreading-bearing of the body, tilts outwardly and slides upon the key to which it is suspended while so doing. The lower end of the cutter tilts inwardly at the same time. Thus, the cutter produces a teetering action, the fulcrum being at the point of contact at the inner face of the cutter, where it bears against the spreading-bearings of the reamer body. Now, with the Wilson underreamer, there is no such teetering action. It is true the extreme upper end of the cutter has a tendency to tilt outwardly while the cutters are being collapsed and drawn downwardly into collapsed position, but it is only that portion of the cutter which is above the suspension means—very different from the Double cutters, as his cutters tilt [391] outwardly above the bearing points or points of contact on the reamer body. With the Wilson reamer the cutters do not slide inwardly or outwardly upon the suspension-means or T; they merely swing from the suspension-means as a pendulum swings. The expansion or contraction of the Wilson underreamer cutters is produced by the following means: The tapering ends or wedge-like projections which form the lower extremities of the forks or two prongs of the reamer body act as wedges or spreading-bearings upon which the cutters ride. The points on the cutters which contact with these spreading-bearings of the

(Testimony of E. C. Wilson.)

reamer body are placed in an entirely different position on the cutter from the point of contact on the Double underreamer cutter. The Wilson underreamer cutters are so formed that the main body of same projects a considerable distance to each side of the shank of the cutter. These projections form shoulders which are machined to correspond with and to rest upon the wedge-like projections on the ends of the prongs or forks of the Wilson reamer body. There are no V-grooves planed in the backs of the Wilson underreamer cutters, such as are found on the backs of the Double cutters, for the reason that they are not needed; there is no occasion for them. The design of the Wilson reamer body is such that when the cutters themselves are collapsed together there is no part of the reamer body itself interposed between the cutters. To collapse them they are simply drawn down until the shoulders on the extended body, or widened body, ride over and below the spreading-bearings or wedge-bearings on the ends of prongs of the reamer body. The cutter, being suspended on a T, merely swings inwardly from its suspension-means. There being no material between the two cutters, that is, no portion of the body itself, there is nothing to prevent the cutters from swinging toward each other as they commence to collapse while riding down the taper-faces of the spreading-bearings of the reamer body. To expand the cutters, the force of the spring draws them up as they bear on the spreading-bearings [392] of the prongs of the reamer body, and the wedge- action

(Testimony of E. C. Wilson.)

together with the taper face of the spreading-bearings finally crowds them out into full expanded position. I think that is all. No; I might add: The upper ends of the Wilson cutters do not come in contact with any angular faces or any angular grooves to in any way assist them to collapse or to expand. There are no such means employed on the Wilson underreamer, and that feature alone makes a very marked difference in the principles of action between the two designs of reamers.

Q. 920. Then, to sum up your conclusions, the principles of action of "Complainants' Exhibit Double Underreamer" and of the device of "Defendant's Exhibit Wilson Patent," in expansion and contraction of the bits or cutters, are distinctly different and not substantially the same? Is that your testimony?

Mr. BLAKESLEE.—Objected to as leading, and as attempting to place a construction arbitrarily upon the preceding testimony of the witness.

Mr. LYON.—Read the question. (Question No. 920 read by the Special Examiner.)

Mr. BLAKESLEE.—And as calling for an arbitrary conclusion.

A. There are very marked differences.

Q. 921. (By Mr. LYON.) Will you please answer the question yes or no? Read the question again. (Question No. 920 re-read to the witness by the Special Examiner.) Give us a yes or no answer, please.

A. They are not the same.

Q. 922. And the "Complainants' Exhibit Double Underreamer" and the device shown and described

(Testimony of E. C. Wilson.)

in "Defendant's Exhibit Wilson Patent" employ distinctly different mechanical principles in the relations and actions of the spreading-portions, thrust-bearings, and inter-engaging dovetails of the bit and body portion, do they?

A. Yes, sir; they do. [393]

Q. 923. Is the principle of action of the co-operative parts in the expansion of the bits or cutters of "Complainants' Exhibit Double Underreamer" and "Defendant's Exhibit Double Underreamer" different, or the same?

A. The means employed to expand or collapse the cutters are virtually the same.

Q. 924. They are identical, are they not?

A. No, sir.

Q. 925. How do they differ? Please note that the question refers to the expansion and contraction of the cutters only.

A. The principles are the same. There is a little difference in the division of force employed to obtain the full expansion or collapsion. One depends more on the taper-grooves which incline upwardly and inwardly and in which the cutters travel than the other does.

Q. 926. Which one of these two devices depends more upon such taper?

A. The later device, I think.

Q. 927. "Complainants' Exhibit Double Underreamer"?

A. "Complainants' Exhibit Double Underreamer."

(Testimony of E. C. Wilson.)

Q. 928. When the bits or cutters of a Double underreamer are collapsed, what function does the metal at the bottom end of the underreamer and lying between the bits in collapsed position, perform?

Mr. BLAKESLEE.—Objected to as indefinite. By “Double underreamer,” does counsel include both of the Double underreamer exhibits which have been discussed by the witness, namely, complainants’ and defendant’s, or only one, and, if one, which?

Mr. LYON.—Both of them. The witness has stated that they are the same, so far as the principles of action of the collapsion and contraction of the cutters are concerned. Read the question to the witness. (Question No. 928 read to the witness by Special Examiner.) [394]

A. It acts as a stop or a retaining-means, an abutment over which the shoulder across the back of the Double cutter engages or hooks onto that portion of the reamer body, holding the cutters in collapsed position and overcoming the tension of the spring.

I have never signed any interest in the Wilson underreamer patent to anyone. I am simply a customer of the Wilson & Willard Manufacturing Company so far as the manufacture of the Wilson underreamer is concerned.

E. C. WILSON, recalled.

Direct Examination Resumed.

(By Mr. LYON.)

Q. 935. Referring again to “Complainants’ Exhibit Double Underreamer,” if the bits of this reamer were cut away so that that portion of the bits on the

(Testimony of E. C. Wilson.)

inner faces registering with the shanks were not raised above the inner face of the shanks of the bits but continued straight and did not contact at any time with the spreading-surface, would the principle of action of the parts of such underreamer in expanding or collapsing remain the same as now embodied in the exhibit "Complainants' Exhibit Double Underreamer"?

A. I think you are mistaken in your statement that the raised portion of the cutter at the back of the cutter projects beyond the back of the shank of the cutter. The projection or portion of the back of the cutter which comes in contact with the spreading-face of the hollow slotted extension is in exact plane with the upper end of the back of the shank—back of the upper end of the shank—so that before the material is planed out to form the V-shaped grooves the back of the shank of the cutter is a flat plane.

Q. 936. Well, you seem to have identified without difficulty the portion that I have referred to. Now, if the portion that I [395] have referred to were cut away so that for the widths of the shank of the cutter there was no contact of the bit at any time with the spreading-surface, would the principle of action of the parts in expanding or collapsing be the same as now embodied in the exhibit underreamer "Complainants' Exhibit Double Underreamer"?

A. Do I understand you to mean that if this entire bearing point was removed, or only that portion of it

(Testimony of E. C. Wilson.)

which constitutes the back of the shank of the cutter?

Q. 937. That portion which is of the same width as the shank of the cutter.

A. A certain amount of the back of the cutter would have to remain in order to give it the full expansion that the cutter has in its normal state. With that portion of the back of the cutter remaining intact, namely, that portion of the bearing which is on the body proper of the cutter and which forms the faces on the body and on the projecting shoulders of the body—if that remained, the cutter would expand to position over the spreading-bearing as now, although its action would probably be modified by reason of the changed position of the lower wall or shoulder of the V-shaped groove lowering the same further down on the shank.

Q. 938. You say that the action would be modified. Would it still be the same principle of action?

A. Yes, sir; it would. There would be simply a modification of the amount or extent to which the cutters would be expended or contracted.

Q. 939. Now, again referring to cutting away the portion of the shank of such cutter or bit at the point that you identified for me in response to my previous question, and cutting that deep enough so that no portion there would contact, and permitting the contact to come only at the sides of the extension on the body beyond the width of the shank of the cutter, and permitting only those points or shoulders to contact with the end or expanding surface of [396]

(Testimony of E. C. Wilson.)

“Complainants’ Exhibit Double Underreamer,” would such bit then used in “Complainants’ Exhibit Double Underreamer” have the same principle of action in expansion and contraction as is present in said exhibit with the cutters in the form shown in said exhibit, or would it be a different principle of action? A. It would be a different action.

Q. 940. Would you say distinctly different action from that now embodied in “Complainants’ Exhibit Double Underreamer?”

A. It would eliminate one of the means now employed by Double and as exhibited by “Complainants’ Exhibit Double Underreamer,” to expand the cutters.

Q. 941. Then, in your opinion, as a mechanic, it would form a distinct device, would it?

Mr. BLAKESLEE.—Objected to as indefinite; and, also, as leading.

A. It would be a different device; yes, sir.

I have instructed Mr. Raymond Ives Blakeslee, one of my counsel, to notify the Union Tool Company that the manufacture and sale of Underreamers like “Complainant’s Exhibit Double Underreamer” was in my opinion an infringement of the letters patent #827,595, namely the Wilson underreamer patent.

Such instructions were given by me after I finished giving my deposition in this case on behalf of the defendant.

Q. 946. (By Mr. LYON.) And you fully considered, in that connection, the principles of opera-

(Testimony of E. C. Wilson.)

tion and the principles of action of the bits or cutters in collapsing and contracting in both said exhibits "Complainants' Exhibit Double Underreamer" and "Defendant's Exhibit Wilson Underreamer Patent," did you?

Mr. BLAKESLEE.—Same objections.

A. I fully considered both matters; yes, sir.

Q. 947. (By Mr. LYON.) And, basing your opinion upon your knowledge of mechanics, you were of the opinion that such "Complainants' Exhibit Double Underreamer" embodied substantially the [397] construction shown and described in such "Defendant's Exhibit Wilson Underreamer Patent," did you?

Mr. BLAKESLEE.—Same objections, and with the added objection that the question calls for a conclusion on the part of the witness or a statement of a conclusion previously reached.

A. I am convinced that the changes made in the design of the Double underreamer, and which changes are embodied in the "Complainants' Exhibit Double Underreamer," employ enough of the principles covered by the Wilson patent to be infringing on that patent.

(By Mr. LYON.)

Q. 948. And you still remain of the same opinion, that "Complainants' Exhibit Double Underreamer" embodies sufficient of the principles of construction and mode of operation, principle of action, of the device of said Exhibit Wilson patent, to be an infringement thereof, do you?

(Testimony of E. C. Wilson.)

Mr. BLAKESLEE.—Same objections.

A. The changes in the Double reamer and improvements thereon, and which changes and improvements are embodied in the “Complainants’ Exhibit Double Underreamer,” are such, in my opinion, as to make that device an infringement on the patent issued to myself, numbered 827,595, issued July 31, 1906.

Q. 949. (By Mr. LYON.) Now, answering as a mechanic, Mr. Wilson, will you please answer the preceding questions yes or no?

(Question No. 948 read by the Special Examiner.)

A. I consider that it employs a sufficient number of the principles of construction to infringe on the Wilson patent.

Q. 950. Do you still consider that the “Complainants’ Exhibit Double Underreamer” embodies the same principle of action, mode of operation, interrelation of the parts, as shown in “Defendant’s Exhibit Wilson Underreamer Patent”? Please answer this yes or no? You can readily do so.

Mr. BLAKESLEE.—The same objections. [398]

A. They do not use the same principles of action.

Q. 951. (By Mr. LYON.) In the expansion and contraction of the cutters, do they use the same mode of operation? Answer yes or no, please.

A. In accordance with my understanding of the term “mode of operation,” as I have endeavored to explain it before, there are numerous underreamers which could be said to be the same in mode of operation, many of which were older than the Double.

(Testimony of E. C. Wilson.)

Mr. LYON.—We move to strike the answer of the witness from the record and exclude it from consideration, as not responsive to the question; and ask that the witness be re-read the question and that he answer it yes or no, and he will be given a full opportunity to make any explanation that he wants after so answering. And demand is made that he confine his answer to personal knowledge and that he do not give matters of hearsay.

(Question No. 951 read to the witness by the Special Examiner.)

A. Will you explain to me what you mean by “mode of operation”?

Q. 952. In you answers you have used the term “mode of operation,” and said that the mode of operation of the “Complainants’ Exhibit Double Underreamer” and “Defendant’s Exhibit Wilson Underreamer patent” are substantially the same. Now, please tell me what you mean, in that answer, by the term, “mode of operation.”

A. I think I explained that by mode of operation, as I understood it, reference is made to the forces employed, or the means, brought into force, to place the machine in operation, such means and forces being separate and apart from any of those employed in the device or machine itself.

Q. 953. Then, you differentiate between “mode of operation,” as referred to in a machine or device, and the principle of action and the manner in which the parts co-act together to secure a given [399] result, do you?

(Testimony of E. C. Wilson.)

Mr. BLAKESLEE.—Objected to as leading.

A. Yes, sir; I think it is proper to make a distinction.

Q. 954. (By Mr. LYON.) Well, I am not asking you, Mr. Wilson, whether you think it is proper to make a distinction, but I want the record to clearly show what you mean by “mode of operation” and whether you use that term as applied to the general method in which a tool or machine is used as distinct from the manner in which the parts of the tool co-operate in the tool to produce a given result.

A. When I say that the—

Mr. BLAKESLEE.—Just a moment. Objected to as leading.

A. When I say that the mode of operation of the Double underreamer, Complainants’ exhibit, and the device covered by the Wilson patent, No. 827,595, are substantially the same, I do not mean that the mechanical construction and application of parts and co-operation of parts or assembling of the parts are the same.

Q. 955. (By Mr. LYON.) Well, then, just explain to us what it is in these two devices that you have last referred to, “Complainants’ Exhibit Double Underreamer” and the device of “Defendant’s Exhibit Wilson Underreamer Patent,” that you term the “mode of operation” and which you say is the same.

A. Well, I will repeat that by “mode of operation,” I have in mind the means necessary to put the machine into operation, such means being out-

(Testimony of E. C. Wilson.)

side of and separate and apart from any of the mechanical means or devices within the device itself.

Q. 956. The well-casing, for one thing?

A. Yes, sir. That has something to do with the mode of operation of the underreamers.

Q. 957. The string of tools and operating line?

A. Yes, sir. That would have its part.

Q. 958. What else?

Q. The act of operation of the drillers in drawing the [400] cutters together—collapsing them, in other words, and holding them collapsed by some device or other preparatory to entering the reamer into the casing; the act of running the reamer down the casing; the act of running the reamer below the casing until the cutters expand to reaming position, and then the action of the tools as applied to the reamer in giving it the necessary stroke to do the cutting or reaming required; the withdrawal of the reamer into the shoe; the downward and collapsing action of the cutters; and the withdrawal of the reamer cut through the casing at the top of the hole.

Q. 959. Now, how much of the action of the collapsing of the cutters do you include in the mode of operation as thus defined by you?

A. To collapse the cutters, whatever means are employed.

Q. 960. You misunderstand my question, again. I do not ask you as to the differences, but I ask you how much of the action of the collapsing of the cutters you include in your meaning of the term, "mode of operation," as you have just been testifying.

(Testimony of E. C. Wilson.)

A. Whatever is necessary to be done by the drillers or the toolies in order to hold the cutters down or to collapse them together.

Q. 961. That is, disregarding the mechanical agencies or parts of the tool devices, including the bits and the parts upon which they act on the body of the underreamer, is it?

A. I have tried to make myself clear by saying that I do not include any of the actions or forces or means obtained from within the machine itself.

Q. 962. Or the interrelation of such parts within the machine?

A. Or the interrelation of such parts within the machine. [401]

Q. 963. And you have used the term, "principle of action," as referring to the principles upon which the bits and other corelated parts of the two devices act within the devices themselves, have you?

A. That is substantially correct; yes, sir.

Q. 964. As you understand the "Complainants' Exhibit Double Underreamer," the V-shaped notches or dovetails at the bottom of the body perform no function whatever in the contraction or expansion of the bits, do they? A. Yes, sir; they do.

Q. 965. In your last answer do you refer to the dovetails in which the shanks of the cutters operate, or do you refer to the bottom V-shaped notches.

A. I mean the change in construction of the Double underreamer occasioned by the V-shaped notches.

Q. 966. What change?

A. The resultant extension of the spreading-wall

(Testimony of E. C. Wilson.)

or hollow slotted extension below the grooves or dovetails in which the shanks of the cutters play.

Q. 967. What difference did this extension make?

A. It makes one of the decided advantages that I have always claimed, and do claim yet, that I have—that I employ—in the construction of the Wilson underreamer, by having the spreading-bearings extending a considerable distance below the dovetails, bracing the cutters firmly apart quite a way down toward the cutting edge, where the force is applied which has a tendency to crush the cutters together, thus more firmly bracing the cutters apart and transferring that leverage which is applied to the cutter from the shank down to a point where the power is applied across the body of the cutter, and which is the strongest part of the cutter and which enables the cutter to more completely and more surely withstand the strains. [402]

Q. 968. Has this change in the Double underreamer changed, in any manner, the principle of action in the matter of expansion and contraction?

A. Well, there is a great deal more to an underreamer than the mere fact of its expansion and contraction.

Q. 969. Will you please answer the question as to the principle of action on which this device now works as contrasted with it before this change was made, and answer the preceding question?

Mr. BLAKESLEE.—The attention of the Court is particularly called to the nature of the present question, and its barrenness with respect to any

(Testimony of E. C. Wilson.)

proper rebuttal inquiry. It is asked that such particular attention in this respect be given this question in connection with the motion which will be made at the conclusion of this deposition.

Mr. LYON.—Read the last two questions and answers, the last one first, and the first one last.

(Question No. 969 read to the witness by the Special Examiner; and Question No. 968 and the answer thereto also read to the witness by the Special Examiner.)

A. Those are about the only features of the underreamer that have not been changed in action.

Q. 970. And they have not been changed; the principles of expansion and contraction remain practically the same as they were before, and, in your opinion, they are substantially different from those of the Wilson underreamer of "Defendant's Exhibit Wilson Underreamer Patent," are they?

A. The means employed to expand the cutters of the Double reamer are altogether different from those employed to expand the cutters of the Wilson reamer.

Q. 971. I ask that the question be re-read to the witness and that he answer it yes or no. (Question No. 970 read to the [403] witness by the Special Examiner.)

A. They are different. Yes, sir.

Q. 972. Radically different or substantially the same—which?

A. There is a radical difference in the form of construction and the means employed to expand the cutters.

(Testimony of E. C. Wilson.)

Q. 973. The difference is so radical as to give an entirely different principle of action in that respect, is it?

Mr. BLAKESLEE.—Objected to as leading.

A. Yes, sir; there is a difference in the action.

Q. 974. (By Mr. LYON.) A radical difference in the action, in your opinion?

Mr. BLAKESLEE.—Same objection.

A. Yes, sir; there is a radical difference in the action.

Letter identified by witness is offered in evidence as "Complainant's Exhibit Blakeslee Letter of February 3, 1913."

Q. 979. (By Mr. LYON.) The underreamers referred to in this letter which has just been offered in evidence, Mr. Wilson, were of the type which is exemplified in this case as "Complainants' Exhibit Double Underreamer," are they?

Mr. BLAKESLEE.—Objected to as leading, irrelevant, immaterial and incompetent; and as inquiring with respect to a matter manifestly of the nature of a privileged communication.

A. They are.

E. C. WILSON, recalled.

Cross-examination.

(By Mr. BLAKESLEE.)

Q. 980. Please now refer to the V-shaped notches or dovetails at the bottom of the body of "Complainants' Exhibit Double Underreamer," which produce the lateral extensions of the spreading wall or hollow slotted extensions, and tell us the function or [404]

(Testimony of E. C. Wilson.)

service of these notches or these notched portions or the resultantly formed lateral extensions.

A. The result of machining those V-shaped grooves is multifold. It extends the wedge or spreading-bearings a considerable distance below the lower end of the ways or dovetail grooves machined in the body. This extension transfers the fulcrum or the point of contact further down on the cutters when the cutters slide or tilt over this spreading-bearing. When the underreamer is in operation, probably the greatest force applied against the cutters, unless it be the actual end-thrust of the cutters against their bearings at the upper ends of their shanks, is the tendency to crush the lower ends of the cutters toward each other. It is evident at once that the more closely or the more nearly we place the spreading-bearing in line between the cutting edges of the two cutters, the more completely that force is resisted, and, consequently, the less leverage is applied to the cutter to offset that force. In the old style Double underreamer the lower extremity of the spreading-bearing, when the cutters were in expanded position, came in contact with the cutter at the lower end of the shanks, just where the shank joins the body of the cutter. The cutter is naturally weaker at that point than it is across the body itself of the cutter. Consequently, these V-shaped grooves have overcome one of the faults of the old Double underreamer, viz.: The application of the strain referred to at the shank of the cutter, and now transmit that strain further down the cutter in such a

(Testimony of E. C. Wilson.)

manner that the strain is now taken up on the body of the cutter. Another one of the advantages gained by these V-shaped grooves over the old style Double underreamer, is the extension at right angles to the shanks of the bearings on the backs of the cutters, which bearings rest on this stationary wall or partition of the reamer body when the cutters are expanded. It will be quite clear that this extension of these bearings brace on the cutters and prevent a tendency of the cutter to rotate [405] from side to side. To have widened the shoulders of the old style Double underreamer sufficiently to give the additional cutting surface desired and which is now obtained by the improved Double underreamer, as shown in "Complainants' Exhibit," it would have been done at the risk of throwing a very considerable additional strain to that cutter, where the forces would be applied, at one corner of the cutter and not at the other. The tendency would be, as suggested before, to rotate the cutter in the dovetails, throwing the heavy outward strain at one side of the shank and an inward strain on the cutter on the opposite side of the shank. Consequently, it would probably have been altogether impractical to have widened the body of the old style Double underreamer cutter without some means of extending the bearings at the backs of the cutters correspondingly. This could not have been done with the old style Double underreamer cutter, as by that form of construction there was no point on the old style Double underreamer body on which said bearings on the cutters could have rested.

(Testimony of E. C. Wilson.)

Q. 981. Please read the question. (The Examiner reads Question No. 980.)

Mr. LYON.—We move to strike out the preceding answer of the witness from the record on the ground that it is not responsive to the question.

A. Another advantage gained by the improved Double underreamer, as shown by complainants' exhibit, over their old style reamer, is the additional amount of stock or material which they are now able to place in the cutter body. This gives the cutters more life; it lasts longer; it requires more time and service to use up the stock in the body. Another advantage is the additional width of the cutting face. In other words, the increased cutting area enables the reamer to cut more of the circumference of the hole at each stroke of the tool. [406]

Q. 982. (By Mr. BLAKESLEE.) Let me interrupt the witness again. Read the question to him. (Question 980 read by the Examiner.) And I will ask the witness to confine the answer to the scope of the question. I will call the attention of the witness particularly to that part of the question which inquires into the functions of the extensions specified.

A. The function of the V-shaped grooves themselves is to enable the use of a wider cutter, give more bearing surface on the cutter and on the reamer body to resist the wear, and to make a stronger cutter and to make a reamer body which braces the cutter better. The grooves themselves are merely the result of shaping the body to do those things. So far as the grooves themselves are concerned, they have little or no functions.

(Testimony of E. C. Wilson.)

Q. 983. Now, with what do the surfaces consisting of the lateral extensions of the hollow slotted extension of the body of "Complainants' Exhibit Double Underreamer," which lateral extensions are produced in forming the V-shaped notches or dovetails at the bottom of the body, coact?

A. They coact with the bearings on the extended shoulders of the cutters.

Q. 984. What is the effect and result of such coaction of these lateral extensions and these lateral bearings on the cutters?

A. As I explained in a previous reply, they give more bearing surface to the backs of the cutters and to the spreading-bearing on the reamer body, and enable them to better withstand the strain applied thereto, and to more firmly brace the cutters to prevent the rotary motion previously referred to.

Q. 985. Does the coaction of these lateral extensions of the spreading-bearings or the lateral extensions produced by the formation of the V-shaped notches or dovetails at the bottom of the body of "Complainants' Exhibit Double Underreamer," with the lateral extensions or bearings upon the cutters, enter into and play a part in the actual expansion and contraction of the cutters to [407] and from the actual working condition of expansion?

A. Those parts are in contact and, in all probability, those portions of the reamer body and the cutters bear a certain portion of the strain or friction whilst the cutters are traveling for at least a portion of their stroke while being collapsed or expanded, and to that

(Testimony of E. C. Wilson.)

end may be said to play a part in the actual expansion and contraction of the cutters.

Q. 986. During the contact of these lateral bearings or extensions on the cutters of "Complainants' Exhibit Double Underreamer" with the lateral extensions of the same underreamer formed by producing the V-shaped notches at the lower end of the body, and during any period of the motion while such surfaces are in interengagement, is there any actual approach during the contraction or separation during the expansion of the lower or cutting edges of the cutters?

A. There is, due to the angular face of the dovetail grooves in which the cutters travel. The outer faces of those dovetail grooves incline upwardly and inwardly, and the moment the cutters are drawn downwardly the extreme lower ends of the cutters commence to move toward each other.

Q. 987. Is any such approach or separation of the lower or cutting edges of the cutters in that underreamer caused by the interengagement of such lateral extensions or bearings upon the cutters with the extensions on the body formed by producing such V-shaped notches or dovetails at the bottom of the body?

A. The motion that is obtained during the period of time that those points are in contact and while the cutters are moved either up or down, is produced by a combination of the bearing referred to and also by the bearings across the entire face of the bearing surface in the hollow slotted extension, and also with the

(Testimony of E. C. Wilson.)

motion produced by the angular face of the dovetail grooves in the body, and, therefore, the particular bearing faces referred to [408] may have something to do with the travel in or out of the cutting edges of the cutters during the period of time referred to.

Q. 988. The lateral extensions of the body formed by producing the V-shaped notches at the lower end of such body in "Complainants' Exhibit Double Underreamer," have parallel faces, have they not, or faces parallel with and a plane coincident with the longitudinal or vertical axis of the body, have they not? A. They have.

Q. 989. Now, as to the portions or surfaces of these lateral extensions which are beneath the said parallel faces of the lateral extensions formed by producing the V-shaped notches at the lower end of the body of "Complainants' Exhibit Double Underreamer," do the lateral extensions or shoulders upon the cutters of this exhibit coact in any respect with these lower inclined surfaces? A. They do not.

Q. 990. What in the cutters of "Complainant's Exhibit Double Underreamer" does coact with these synclinal or inclined surfaces at the lower end of the body?

A. The shoulder produced by the V-shaped groove planed across the back of the shank of the Double underreamer cutter, which shoulder projects upwardly and outwardly and is the shoulder furthest down or the one nearer the lower end of the cutter.

Q. 991. Do you find any parts of the cutters of

(Testimony of E. C. Wilson.)

“Defendant’s Exhibit Double Underreamer” or of the Double underreamer pictured and described in “Complainants’ Exhibit Double Underreamer Patent,” which are capable of coengaging with the lateral extensions at the lower end of the body of “Complainants’ Exhibit Double Underreamer,” formed by producing the V-shaped notches or dovetails, in a manner similar to the coengagement of such lateral extensions on the body with the lateral extensions or shoulders upon the cutters of “Complainants’ Exhibit Double Underreamer”? A. No, sir. [409]

Q. 992. Now, these same lateral extensions or shoulders upon the cutters of “Complainants’ Exhibit Double Underreamer” are present, are they not, in the cutters of “Defendants’ Exhibit Wilson Underreamer Patent”? A. They are.

Q. 993. Please state whether these lateral extensions upon the cutters of “Complainants’ Exhibit Double Underreamer” perform similar offices to those of the lateral extensions or shoulders of the cutters in “Defendant’s Exhibit Wilson Underreamer Patent”; and, if so, what such similar offices are.

A. They do perform similar services. The similarity consists in widening the body of the cutters, giving a greater cutting surface and more material in the cutter, giving longer life of the cutters; also in forming a point or position where the bearings can be placed at the extreme limits of the extension of these shoulders, which, as previously described, more firmly brace the cutter and transfer the point

(Testimony of E. C. Wilson.)

of contact to a place where the cutters are stronger and better able to resist the strain.

Q. 994. In "Complainants' Exhibit Double Underreamer Patent," or in "Defendant's Exhibit Double Underreamer," do you find any features of construction analogous to or like the lateral extensions produced to the periphery of the body of "Complainant's Exhibit Double Underreamer," at the lower end of the body, and formed by producing the V-shaped notches at the lower end of the body?

A. No, sir; there are no such features to be found on the device as shown by "Complainants' Exhibit Double Underreamer Patent" or by the device as shown by the "Defendant's Exhibit Double Underreamer."

Q. 995. In order to provide surfaces for these lateral extensions or shoulders of the cutters in "Complainants' Exhibit Double Underreamer Patent," that is, surfaces for coengagement of such shoulders, the V-shaped notching or notching of some sort of [410] the lower end of the body of the reamer to or toward the periphery of the body, was necessary, was it not?

A. A certain amount of the stock of the Double underreamer body had to be removed in order to do so; and it could have either been in the V-shaped groove or in a rectangular groove.

Q. 996. In other words, the cutters of "Complainants' Exhibit Double Underreamer" could not coact with the body of "Defendant's Exhibit Double Underreamer" or the body of the underreamer dis-

(Testimony of E. C. Wilson.)

closed in "Complainants' Exhibit Double Underreamer Patent," so as to provide for use of and take advantage of the lateral extensions or shoulders upon the cutters of "Complainants' Exhibit Double Underreamer Patent," without so altering and essentially changing the formation of the lower end of the body of the reamer, could they?

A. They could not.

Q. 997. And, I take it from your previous answers, and I ask you if I am correct in so taking it therefrom, that a material advantage gained in so altering the lower end of the body of the Double underreamer was to permit the bodies of the cutters themselves to bear upon or against the altered body of the underreamer so that there might be a strain-resisting back or reinforcement for the cutters at the bodies thereof and beneath the shanks thereof?

A. Yes, sir; that was one of the big advantages gained.

Q. 998. And providing the cutters of "Complainants' Exhibit Double Underreamer" with enlarged bodies, resulting from extending the bodies of the cutters laterally to form the shoulders thereon, produced cutter bodies having more stock for the same size reamer, than was provided in "Defendant's Exhibit Double Underreamer" or in an underreamer constructed in accordance with the disclosure of "Complainants' Exhibit Double Underreamer Patent"? Is that so? A. Yes.

Q. 999. And what, if any, advantage resulted therefrom?

A. It increased the cutting surfaces, which enables [411] the cutter to ream or cut more of the circumference of the hole at each stroke, and also gave additional life of the cutter by reason of the added amount of material in the cutters, and also strengthened the cutter by increasing the amount of material in the body of the cutter itself.

Q. 1000. I take it that you would designate as a particular advantage attaching to the provision of lateral extensions or shoulders on the cutters, of "Complainants' Exhibit Double Underreamer," which you have said are the same as the lateral extensions or shoulders upon the cutters of "Defendant's Exhibit Wilson Underreamer Patent," and of producing the lateral extensions upon the body of the reamer by forming the V-shaped notches at the bottom of the body, consists in the effective bracing which results from the coaction of these shoulders with these lateral extensions upon the body, laterally of the shanks of the body? Am I correct in that?

A. Yes, sir; that is one of the chief advantages.

Q. 1001. As to "Defendant's Exhibit Wilson Underreamer Patent," the lateral extensions or shoulders, 4³, bear upon the surfaces, 9, on the prongs at the lower end of the body when the cutters are in expanded position, effectually bracing the cutters at the bodies thereof and laterally of the shanks of the cutters, do they not? A. They do.

Q. 1002. Then I take it from your previous testimony that the portions of the lateral extensions

(Testimony of E. C. Wilson.)

upon the body of "Complainants' Exhibit Double Underreamer" formed by the V-notching of the body at the lower end, with which portions the shoulders or lateral extensions upon the cutters of "Complainants' Exhibit Double Underreamer" coengage, serve in this bracing function similarly to the surfaces, 9, on the sides of the prongs of "Defendant's Exhibit Wilson Underreamer Patent"? Is that correct? [412]

A. Yes, sir.

Q. 1003. And, furthermore, the lateral extensions or shoulders upon the bodies of the cutters of "Complainants' Exhibit Double Underreamer" which coact with the lateral extensions upon the body of "Complainants' Exhibit Double Underreamer," formed by producing the V-shaped notches at the lower end of the body, act similarly in this bracing relation to the surfaces, 4³, of the cutters of "Defendant's Exhibit Wilson Underreamer Patent"? Is that correct? A. Yes, sir; they do.

Q. 1004. Previous to your manufacture of the reamers like "Complainant's Exhibit Wilson Underreamer," did you ever see an underreamer manufactured by the complainant company—the Union Tool Company—having the lateral shoulders or extensions upon the cutters and the coacting surfaces upon the body of the V-shaped notches, similar to "Complainants' Exhibit Double Underreamer"?

Mr. LYON.—Objected to as not cross-examination and as leading, incompetent, and not the best evi-

(Testimony of E. C. Wilson.)

dence, no foundation laid for the introduction of secondary evidence.

Mr. BLAKESLEE.—In connection with this objection the attention of the court is particularly called to questions 975 to 979, inclusive, and the answers thereto, of the direct examination of this witness in these proceedings on behalf of complainants; and particularly to question 979 and the answer thereto, such question being, “The underreamers referred to in this letter which has just been offered in evidence, Mr. Wilson, were of the type which is exemplified in this case as ‘Complainant’s Exhibit Double Underreamer,’ are they””? As to the objection on the ground that the question is leading, it is only to be remembered that this is a question on cross-examination.

A. No, sir.

Q. 1005. As to the manufacture of underreamers like “Complainants’ Exhibit Wilson Underreamer” by the defendant company, [413] such manufacture is under your consent as owner of the letters patent, “Defendant’s Exhibit Wilson Underreamer Patent,” is it not? A. It is.

Redirect Examination.

(By Mr. LYON.)

Q. 1006. Do the lateral extensions of the cutters or bits of “Complainant’s Exhibit Double Underreamer” perform the same or substantially the same functions as the lateral extensions of the Wilson underreamer?

A. They perform a portion of the same functions.

(Testimony of E. C. Wilson.)

Q. 1007. Are the functions substantially the same?

A. A portion of the functions which they perform are substantially the same.

Q. 1008. What portion?

A. They brace the cutters against the rotary motion which I have previously described; their very existence widens the body of the cutter, which gives more cutting surface to the cutter, increasing the strength of the cutter, gives more material in the cutter and, consequently, a longer life.

Q. 1009. In their mechanical co-operation with the coacting surfaces on the body of the underreamers, do the lateral extensions to which you have referred on the cutters or bodies of "Complainants' Exhibit Double Underreamer" perform the same or substantially the same functions as the lateral extensions of the bodies of the Wilson underreamer?

MR. BLAKESLEE.—This question and the three preceding questions are objected to as leading.

A. I will repeat that they perform a portion of the same functions.

Q. 1010. Those are the functions which you have referred to in the previous answer? [414]

A. Yes, sir; those are among them.

Q. 1011. Any others?

A. Yes, sir; by that form of construction the strains on the cutter are better resisted and makes a stronger cutter and gives more bearing surface on the cutter itself and on the body and, consequently, better enables the reamer to resist the wear.

Q. 1012. Do they perform the same or substan-

(Testimony of E. C. Wilson.)

tially the same functions in the collapsing and contracting of the bodies?

Mr. BLAKESLEE.—The same objection.

A. To a certain degree; yes, sir.

Q. 1013. The difference is one of degree, then?

A. There is a difference, but it is one of degree, I should say. There is a difference.

Mr. BLAKESLEE.—Let the record show that at the request of counsel for complainant, without explanation to counsel for defendant, the Special Examiner left the room in which these proceedings are being conducted, leaving the witness upon the stand, and, without taking any adjournment, and was so absent from the room for over two minutes by the watch. This proceeding is objected to as irregular and having no warrant under the rules or under the terms of the special reference made to the Examiner in this case.

Mr. LYON.—The Special Examiner will certify on the record at this point what was done outside.

And the Examiner here certifies that by request of Mr. Lyon he retired from the room and read to him Question No. 987, propounded to this witness, and the answer thereto, which question or a portion thereof and the answer thereto were typewritten by Mr. Lyon.

Recross-examination.

(By Mr. BLAKESLEE.)

Q. 1014. Now, as to any analogy between the action of the cutters of "Complainants' Exhibit Double Underreamer" and the cutters [415] of the

(Testimony of E. C. Wilson.)

underreamer of "Defendant's Exhibit Wilson Underreamer Patent," in the expanding and contraction actions, have you anything further to add to your testimony given in cross-examination with respect to the coengagement of the lateral extensions or shoulders of the cutters with the lateral extensions upon the body formed by V-notching the body in "Complainants' Exhibit Double Underreamer"?

A. So far as the general forms of construction are concerned, the Double underreamer cutter as shown by "Complainants' Exhibit," lacks only one thing to make it almost identical with the Wilson underreamer cutter and that is the omission of the V-groove across the back of the shank of the cutter. Otherwise the cutters are about the same.

Q. 1015. My question, Mr. Wilson, was not with respect to the construction of the cutter on "Complainants' Exhibit Double Underreamer" taken by itself, but with respect to the contraction and expansion action and the participation in the same of the lateral extensions or shoulders upon the cutters of "Complainants' Exhibit Double Underreamer" with the lateral extensions upon the body of "Complainants' Exhibit Double Underreamer" formed by V-notching the body at the bottom. As to this participation and strictly in the contracting and expanding actions, have you anything further to add to your previous testimony on cross-examination, completed this morning, qualifying or explaining such participation of such parts and surfaces in such

(Testimony of E. C. Wilson.)

contracting and expanding actions?

A. Inasmuch as those parts are in contact with each other during a portion of the contraction and expansion action of the cutters, they unquestionably perform in a measure the same functions that the bearings at the back of the shoulders of the Wilson underreamer cutter perform when riding on the spreading-bearings of the Wilson underreamer body.

Q. 1016. But those spreading-bearings on the Wilson underreamer body are inclined bearings, are they not, giving by coaction [416] with the shoulders an actual expanding or contracting effect at those points and through those agencies, do they not?

Mr. LYON.—Objected to as leading and suggestive.

A. Yes, sir; the spreading-bearings of the Wilson underreamer body are not parallel. They are tapered downwardly and inwardly, and a downward play of the cutters causes them to swing inwardly at the cutting edges; in other words, to commence to collapse on the first of their travel downward. A similar thing results in the Double underreamer but it is produced in a slightly different way.

Q. 1017. (By Mr. BLAKESLEE.) What do you mean? In "Complainants' Exhibit Double Underreamer"?

A. In both "Complainants' Exhibit Double Underreamer" and in the original Double underreamer exhibited by the patent in suit.

Q. 1018. But I am only referring to such under-

(Testimony of E. C. Wilson.)

reamer as has the lateral extensions or bearings upon the cutters and the corresponding surfaces on the body. Those are not present in the patent Double underreamer construction, are they?

A. They are not.

Q. 1019. Now, you have testified that a number of factors enter into the expanding and contracting actions in "Complainants' Exhibit Double Underreamer." Were none of those features present, save and except the lateral extensions or shoulders upon the cutters and the parallel flat faces of the lateral extensions on the body formed by V-notching the body at the sides at the lower end thereof, would such lateral extensions or shoulders on the cutters and the coengaging parallel extended surfaces upon the body in themselves cause expanding or contracting action?

A. No, sir; not while the faces of the extended lateral faces of the hollow slotted extensions and the faces in the backs of the extended shoulders or bodies of the cutter are in contact. [417]

**Testimony of John E. Sanford, Called as a Witness
on Behalf of Complainants in Rebuttal.**

Mr. Sanford testifies as follows:

I am 53 years of age; resident of Coalinga, California; occupation, driller. Have been in the oil business since 1884; I have used two kinds of underreamers, namely, the Austrian underreamer and the Double. Used the Double reamer in about 1901. I secured the first Double underreamer from the Union

(Testimony of John E. Sanford.)

Tool Company's shop at Santa Paula. Since using the Double underreamer in 1901, I have never used any other style of an underreamer. My reason for never using any other reamer is I never had any as good as the Double. I am using the Double improved type. Comparing the Double improved type with the first Double I used about 1901 as to strength and durability and efficiency I say I never saw a great deal of difference in them. I am acquainted with Mel. Kellerman, yes, sir.

I have knowledge of the use of a reamer by Mr. Kellerman, one of his own production; it was in the Los Angeles field, in the Cottage Home tract. It seems as though pretty near every time they ran it into the hole to ream they had to pull the casing to get it out. I wouldn't call it a practical or successful underreamer, from what I saw of it at that time. I had nothing to do with it personally. My knowledge of them is wholly from the drillers that were working with them.

I had ^{*}nothing to do personally with the Kellerman reamer. I did not personally see the Kellerman reamer put into the hole. No, I never saw the Kellerman underreamer in use. I just saw them at the Baker Iron Works when they were building them. All I know about the use of the Kellerman reamer is what the drillers told me.

The Austrian underreamers would ream so that you could lower the casing if you didn't have a very hard shell. I didn't have very good experience with them. They were too weak. They wouldn't [418]

(Testimony of John E. Sanford.)

stand anything. They were too lightly constructed. No, you can't ream any faster with a new style Double than you can with the old style. I have never made any comparison though.

I have not seen any of the old style Double underreamers used in the last two or three years. I really haven't any preference between the original or old style Double and the improved.

**Testimony of Fred L. Fish, Called as a Witness on
Behalf of Complainants in Rebuttal.**

Mr. Fish testifies as follows:

My name is Fred L. Fish; occupation, driller. I live in Coalinga, California. I am acquainted with Thomas O'Donnell. I have worked for him, both in Los Angeles and Coalinga. I drilled for him at San Fernando at what is called the Alliance Oil Well. Tom O'Donnell sent an underreamer up there. I saw Arthur Willard at that well. I put the O'Donnell underreamer on and reamed a screw with it, that is, just about three or four feet. I mean the length of a temper screw. Then I was about four hours getting it out of the hole. It stuck all the way down the casing. To tell the truth about it, it wasn't any good on earth for underreaming a well. I think the time I refer to was the only time it was used on that well. After I got it out it was thrown off and I don't think it was ever used again on that hole.

I don't know what Willard did do with the underreamer while he was at the Alliance Well.

Q. 19. Do you know what Arthur Willard did at the Alliance Well when he came there?

(Testimony of Fred L. Fish.)

A. He fixed that or else fooled around it. I don't know what he did do to it. But it wasn't used after that. I know that—on that hole. I did not see the 7 $\frac{5}{8}$ " O'Donnell & Willard reamer. I am using a Double reamer at present. I never had any trouble with the old style Double reamers. I prefer the new [419] Double reamer to the old one. The O'Donnell & Willard reamer did its work so far as we went with it. A screw, that is all I underreamed. The formation was not hard.

Q. 36. What kind of formation?

A. It was a kind of sandy conglomerate, but it was not very awful hard, though.

Q. 37. Are you sure it was not limestone or granite?

A. No, sir; it was not limestone. It was a kind of a hardish sandstone.

The trouble we had with the O'Donnell & Willard reamer was getting it back to the casing. The trouble was the block or collar would pack with sand, causing the cutters to stick. I didn't pay a great deal of attention to the reamer. I don't know exactly what happened to the reamer only it gave us trouble in the hole. I have had trouble with Double reamers sticking in the shoe and casing.

The O'Donnell & Willard reamer was so constructed that it had two cutters operating over a wedge or partition between them and was raised or lowered by a spring. The reamer body was formed at the bottom to fit around the shanks of the cutters in such a manner that the cutters were caused to

(Testimony of Fred L. Fish.)

expand when they were drawn up by the action of the wedge between them.

The sleeve or collar on the outside of the O'Donnell & Willard underreamer body did not have to be on there anyway. It was all folly that it was on there.

Yes, I have tied Double underreamer cutters together lots of times in order to get the reamer down the casing. There was no other reamer used in the hole at San Fernando.

I have used the Swan underreamer and several other kinds of underreamers. I have used the Austrian underreamer. Mr. Willard was not there when the reamer was used nor was Mr. O'Donnell there when the reamer was used in the San Fernando well. There wasn't anybody there only me and my tool dresser. Mr. Lehman was not there [420] when the reamer was used. I never saw Mr. Lehman use the reamer on that well. The trouble with the O'Donnell & Willard reamer was the cutters were too wide. It did not leave room enough for the cuttings to come around at the sides of the cutters. I continued to work for Tom O'Donnell after leaving that well but never saw that 9 $\frac{5}{8}$ " reamer again. After I got this reamer out of the hole I have been talking with Mr. O'Donnell quite a little over it and I told him it was no earthly good.

**Testimony of R. E. Gray, Called as Witness on
Behalf of Complainants in Rebuttal.**

Mr. Gray testifies as follows:

My age is 42; occupation, driller; residence, Coalinga. Have drilled in the Newhall field. That

(Testimony of R. E. Gray.)

was in 1901 or '02. We used the Double reamer. Prior to that we used the old Austrian reamer. It was never any good, never had any success with it.

I never heard of the O'Donnell underreamer at the Alliance Well. The opportunity I had would be from hearing the other drillers talk about it. The same custom prevailed then as now. We get together and we will mention certain tools and new tools especially. We always mention them. I have not found any difference in the amount of underreaming I could do with the Double improved and the Double of 1902, nor in the making of hole. I never heard of that underreamer being used in the Newhall well. I had success with the Double reamer. The Wilson is not as strong a reamer as the Double. I don't like its action. The spring or mandrel does not hold the cutters like on the Double reamer, and I don't class in my opinion the Wilson reamer as being anything like as good as the Double reamer is for all around purposes. The Wilson reamer is not as strong as the old style Double reamer. I think the weak point of the Wilson reamer * * * very weak, is in [421] those two little set-screws in the body of it, which hold the mandrel which carries the cutters. When running it I found those would be bent when I would go to take them out and dress the cutters and change the cutters. Now that, excepting a little cross bolt in the bottom of the reamer below the mandrel is the only thing that I can see that the reamer has to hold the cutters in action. If those break, or even if the spring breaks, you have

(Testimony of R. E. Gray.)

nothing but that little bolt below and you leave the cutters in the well. The experience that I have had is that you break this bolt and leave the mandrel cutters and all in the hole. I have left the cutters, spring and mandrel in the hole. The bottom of the Wilson reamer where the cutters go in is cut straight through, and sides just leave a narrow bearing for your cutter. It don't have the full surface bearing at the bottom of the cutters the same as the Double. I have always claimed and do to-day that it makes it a weaker reamer than the Double. In reaming in bouldery stuff and the like, you will come onto boulders and they will drive in there, and the conditions of the sides projecting down will allow the boulders often to wedge there and break the bottom bolt. I have had that happen with them and not be able to get them out of the bottom. Whereas, with the Double reamer the bottom is solid and comes down clear through and prevents it from doing so. I never broke any Wilson cutters though. I never noticed any spread of Wilson underreamers at the prongs, nor did I ever bend or break any of those portions. Comparing the prongs and mode of action of the cutters in expansion and contraction in the Wilson and in the old style Double reamer with each other, they compare I think the same. That is my opinion of it. The comparison of the two that way are on the same principle. The old style Double cutter is straight and smooth on the inner face just the same as the Wilson,—I mean the inner face of the cutter is straight and smooth.

(Testimony of R. E. Gray.)

Q. 45. Now, the Wilson cutters have extensions at the sides [422] at the cutting ends, have they not, which engage with the edges of the prongs to cause the contraction and expansion of the cutters?

A. I don't think they have.

Q. 46. Well, then, please explain what causes the expansion of the cutters in the Wilson reamer.

A. It is a hard question for me to explain. It has been about three years since I have used the Wilson reamer. It was in the Maricopa field that I used it when I worked there for W. Snook in the New Center Oil Company. To get the real right idea of what you call expansion and contraction, I have got to use my own language as we do around the rigs: That that must be by pulling the cutters down to get them to go in the hole is your contraction. And when they get into the bottom of the pipe ready for work, that is your expansion.

Q. 47. When they get below the bottom of the pipe?

A. Now, will you please read the question the gentleman asked? (Question is read.) That is caused simply by the cutter being made to fit the groove of the reamer—the stock of the reamer—which the principle is right with the type of the old Double reamer. As the spring pulls it up, it sets it out to its expansion.

Q. 48. Then I am to understand, am I, that it is the movement of the Wilson cutters in those grooves which causes the expansion of the cutters?

(Testimony of R. E. Gray.)

A. Yes, as far as I understand your question, that is what I think.

Q. 49. Is there anything in the space in the body at the lower end between the cutters in the Wilson reamer that assists in the expansion of the cutters?

A. I wish you would bring the reamers here and let me see them, and then I can show you and explain to you and understand your meaning very plainly and distinctly then. [423]

Q. 50. Well, I want you to testify from recollection in answering these questions just as you have in answering those propounded by Mr. Lyon. You have testified that the cutters in the Wilson underreamer expand and contract in substantially the same manner as in the Double underreamer. Now, perhaps, you had better tell me in support of that statement just how the Wilson cutters expand and contract.

A. That means for a man to take in to explain to you—would mean for me to take in as much of the reamer as possible for to make anything plain so that you would understand it. In the first place, I have told you it has been about three years since I have used the Wilson reamer—over three—and every day I am in contact with the Double reamer, using it for the company that I am working with. It is much clearer that I could understand that reamer and explain it to you than one that it has been a number of years since I have used it. I did not use the reamer a great while then. Now, that reamer, you see, as you say, it has a slot on the side there that it works

(Testimony of R. E. Gray.)

in, and to pull that reamer down we use a bar to contract that reamer. We pinched them down with the bar and then we would use a block in here on top of the cutter and get the block to hold it till we get it inside of the casing. The cutter, you would bear in mind, would be in the bottom, and we would take the bar to pry in and pull that block out, and you say it works on a slot. That is my recollection of the reamer, and it made it disagreeable in that respect. There was two hooks came along with those reamers. There was a hole in the cutters that you could pull them down in. We never used it. We always barred it down and put it in the hole that way. That is the way we contracted the reamer and the springs, I guess, for the expansion of it when it goes into the hole. That is the only thing that can expand the reamer.

I have broken Double underreamer cutters, yes, sir. I have broken 3. It was on a small reamer. [424]

Q. 57. How many breaks of that kind have you had?

A. I have had three to my personal knowledge. It was on a small reamer.

Q. 58. What became of the cutters?

A. They broke—I never left but one in the hole. I got one out. I left the cutter in the hole.

Q. 59. How did you get them out?

A. We drilled them out.

Q. 60. How did you get them out?

A. I never fished for them. It was in a 61¼ hole

(Testimony of R. E. Gray.)

and we never tried to fish them out. We left them there.

There was some reaming done with Austrian reamers, yes, sir. If I was getting a reamer for myself I would rather have the old style Double reamer than the new because the cutters are stronger. I have had trouble to get Double underreamer cutters out of the hole and I have tied Double cutters together to get them down into the hole. I consider the sub or middle joint in Double reamers a great advantage. My experience with the Double reamer has been that I never broke one of them on a large sized reamer, and I have used them constantly for four years, steady and had one in the derrick all the time from 15-1.2 inch down to 4½. The custom of tying cutters applies equally to the Wilson reamer. I have never had any trouble with the "sub" or joint between the sub and main body of the Double reamer. That joint is stronger than any other joint in the string of tools that you are running. There is no danger in it. It is a big joint and you see what advantage it gives you. It is an advantage to open a joint for a string of tools. It does not weaken the joint. The oftener you open a joint and spring it up and set it up the better the joint is.

Q. 105. The oftener you set it up—

A. Yes, sir; you take a new joint and first start running it, there is rarely one of them that is a good joint. When [425] you break your joint, the oftener you do it and work it, until you overdo it—the oftener you break a joint the more you improve it in its sticking capacity.

**Testimony of Geo. D. Roberts, for Complainants, in
Rebuttal.**

Mr. Roberts testifies as follows:

I am a resident of Coalinga, my occupation is oil driller and I am 52 years of age. I am familiar with underreamers and have used them, yes, sir. I am at present connected with the Stockholders Oil Company. I am president and owner of that company. I am president of the United Development Company of Coalinga and one of the directors of the Little Sespe Oil Company on the little Sespe in Ventura County. Those companies use Double underreamers. We have broken one Double underreamer bit and other portions of Double underreamers. I didn't break the cutter—it was broken under my management. That was a lug we broke within the last three years and I haven't any of the old style Double underreamers. My idea of the V-shaped groove is that it prevents the cutters from spreading apart.

I had a debate recently with one of my men. I decided for myself that the old style Double underreamer was a stronger underreamer than the one they are making at present. That argument arose over the fact that that lug broke diagonally across that way to the slot where the key goes through the mandrel part. I don't think there is quite as much stock in that as there was in the old.

I don't think the cutters have as much stock in them as the old style cutters used to have at that point. We are doing all work faster than we used

(Testimony of Geo. D. Roberts.)

to, but I cannot say that we could attribute that to the difference in the style of underreamers. That is, from the old to the present. We have heavier joints and heavier tools and such things as that, and we give them a little more motion and rap it to them harder and make hole a little [426] faster to-day than we did before. When we first used Double underreamers we had calf wheels. I cannot see that calf wheels are of any assistance when underreaming. Of course it enables you to spud the pipe and assists in underreaming to that extent. I have used the National underreamer and have also used the Austrian underreamer. We had very little underreaming to do with the Austrian but we got along with it. Yes, sir, the Austrian underreamer worked. We had very light tools then and very little underreaming to do. In fact, since the new underreamer came out—the Double and the Wilson—I wondered how we ever got them into the hole or what we have put them in for at all. It was a kind of a makeshift arrangement in my opinion. We have never used Wilson underreamers on our lease. We have five Double reamers of various sizes on our lease now.

**Testimony of Henry Towery, Called as Witness on
Behalf of Complainants, in Rebuttal.**

Mr. Towery testifies as follows:

I am an oil well driller and am now drilling on the Baltimore Oil Company's property, in the Midway Field near Taft. I reside near the town of Taft, California. Have been in the drilling business

(Testimony of Henry Towery.)

since 1900. I have used four kinds of underreamers in the California Field, the Plotts underreamer, the Austrian underreamer, the Double underreamer and the Wilson underreamer. Believe I have used the Double reamer the most. First used the Double in 1902 or '03 in the Santa Maria Field. It gave very good results. It was far superior to the Austrian or Plotts reamers. We used the Wilson reamer in 1905 or '06. It gave considerable trouble to remove the cutters to dress them. I have broken a mandrel and lost a set of cutters or knives of the Wilson reamer. I have lost several of the retaining bolts from the bottom of the Wilson reamer. It didn't [427] amount to much—it did not cause us a great deal of trouble. I broke the mandrel of the Wilson underreamer on Section 25 and lost both cutters in the hole. Mr. W. L. Clay was the superintendent. We had fishing tools made to try to fish them out but had to drive them into the side of the well.

The Plotts and Austrian reamers never were successful. I never could do very much with them. Of course, at that time we did manage to ream with them so as to get the pipe through, that is in some places. Never saw any more Plotts or Austrian underreamers used after the Double reamer came out. The Double reamer was universally used up to the time the Wilson reamer was put on the market. You can drill farther with the Double underreamers than with the Austrian. The introduction of the Double reamer enabled us to drill

(Testimony of Henry Towery.)

with better success. We could get in longer strings of pipe in the hole, been able to carry longer strings of pipe through more difficult formations—harder. The cause of shallow hole in well drilling is because you have to reduce the size of your casing very quickly. That is on some occasions.

I consider that the calf wheel and the steel rope were also necessary in order to drill deep wells. I would not attempt to drill a deep hole to-day unless I had a heavy casing and proper means for handling it. The mandrel or tee of the Wilson underreamer which I broke on Section 25 Hill was broken in the year of 1907 or '08. I was reaming a hard shell.

I have broken one Double underreamer cutter, yes, sir.

I have used both styles of Double underreamers and prefer the last reamer or their improved type. The cutters are better supported and gives them more strength. They are held in the bowl more firmly. We are using Wilson reamers on the lease where I am at present. Do not know whether they have Doubles or not. The only reamers I know of on that lease are Wilson reamers. I have no particular preference between Double and Wilson reamers. [428]

I prefer the improved Double to the old Double because of the dovetail at the bottom—the V-slot.

**Testimony of A. P. Kennedy, Called on Behalf of
Complainants, in Rebuttal.**

Mr. Kennedy testifies as follows:

I am engaged in the oil well drilling business and have been since the '80's. I am field manager for the Brookshire Oil Company on Section 24. That is located near Fellows. I have used Wilson underreamers a little and have used the Double. I have also used the North reamer twelve years ago in April. The North was used on the Pathis Sola Oil Company in the foothills of Whittier. It was a 4½" reamer and we had a two-foot shell. It went through that shell all right. That was all the work we had for it to do. It practically didn't amount to anything. I wouldn't consider the North reamer strong enough to do the amount of work. Where the key goes through the cutters they were too light. We had no trouble in running the North reamer in or out of the casing. No trouble in running it either way. I never tried it except for this two feet. After using this North, I next used the Double and have been using it ever since, except once that I ran the Wilson reamer. I prefer the Double reamer.

The Wilson reamer I used lost the cutter. That was on the Miosa Ranch in San Luis Obispo County. That was six years ago last May I lost the cutter off. The T-bolt pulled down and bent over. That is the reason I didn't like it. I broke one cutter off the Double underreamer. It was occasioned by a crooked hole. I have never found any difference

(Testimony of A. P. Kennedy.)

in time in reaming with the old style Double or the new style, because I never was after making time. The idea was to get the reaming done so that the pipe would follow without any trouble. The casing followed where I done the [429] work because I took time enough to underream. If there was any bolt in the Wilson reamer across the mouth, the reamer from which I lost the cutters, I don't remember it.

The North reamer was the one reamer we used on the Pathis Sola well at Whittier. It did all the reaming that was done on that well while I was there. I don't think they ever had it in the hole any more if I recollect right. We had no trouble with it at all.

**Testimony of John Shupe, Called as Witness on
Behalf of Complainants, in Rebuttal.**

Mr. Shupe testifies as follows:

My name is John Shupe; occupation, well driller. Have been drilling in California for about ten years. Have worked in the Salt Lake fields of Los Angeles. Have used underreamers. I tried the Wilson underreamer there one day. I don't remember very much about it. We only tried it a couple of hours and then we pulled it out and could not get the lugs out. We could not get the bolts out and we threw it out and that is all of my experience with the Wilson underreamer. After that we used Double reamers. I left the Salt Lake Company in about 1907 or '08 and went with the American Petroleum Company, and we are working near

(Testimony of John Shupe.)

Sherman Junction. We use the Double underreamer. I left there in about 1909. Went to Maricopa for the Wellman Oil Company. Used the Double reamers there. I don't see that there is any difference in the old style and new style Double reamers in the speed of reaming.

Q. 19. Comparatively in drilling what difference, if any, do you find in these two styles of Double underreamers? A. In the speed of reaming?

Q. 20. Yes.

A. I don't see that there is any difference.

Q. 21. Is there any material difference in the strength of [430] these two styles of reamers?

A. Well, in one way there is and in one way there isn't. That bevel they have on the lug that fits on the body of the reamer, in case you get on a boulder or anything, it can't spread the lugs. I think that has been an improvement on the reamer.

Q. 22. You refer to the V-shaped slot at the bottom of the new style Double reamer?

A. Yes, sir.

Mr. BLAKESLEE.—Objected to as leading, the witness having talked about features on the cutters.

Q. 23. (By Mr. LYON.) What part does this bevel on the lug that fits on the body fit on to the body, Mr. Shupe? Explain that a little more fully for us.

Q. Well, the V-shape in the body, of course, the lug is cut the same to fit into that V-shape, although the thrust of the reamer does not come on that V-shape at all. As I understand, it is not made for

(Testimony of John Shupe.)

that purpose, but to keep the lugs from spreading in case you should get muddled up or get something in and prevent them from spreading, either on the body or on the lugs.

Q. 24. And otherwise than this feature do you find any difference in the strength of the so-called old style and new style Double underreamer?

A. I should think the old style was a little the strongest, if anything.

If you get a corner thrust it will not break off as quick as the new style would. A blow on the corner tends to twist the cutters. The wider cutters on the Double improved type and wider spreading surfaces at the back would in my opinion better brace the cutters from twisting when such a blow on the cutters would occur. Of course there is more cutting surface on the new or broader type of cutter. I think the wide cutter is a disadvantage as it would have a tendency to break the cutter. [431]

A. Well, for the simple reason that in reaming it makes the cutter that much wider, and by hitting it on the point your reamer does not turn the full width of the cutter every time. If it only hits an inch or a half an inch on one corner, the cutter being that much wider, has—I don't know hardly how to explain that. It would have more of a tendency to break the lug, I should think. We are using only the new style Double underreamers. I would just as soon have the old style Double reamer as the "Improved." I don't know why the bolts or screws stuck in the Wilson reamer. I don't remember.

(Testimony of John Shupe.)

The Wilson reamer did not stick in the hole, no. The bolts or screws stuck in the reamer body so that we could not remove the cutters. That was the only trouble we had with the Wilson reamer that I remember of. We never tried it after that.

After this Wilson reamer gave us this trouble in the Salt Lake Field, we used the Double reamer as long as I was there,—with the Salt Lake or Amalgamated companies. I was there about four years. I have nothing to do with the purchasing of the tools for the company I am now with.

**Testimony of James Jackson, Called as Witness on
Behalf of Complainants, in Rebuttal.**

Mr. Jackson testifies as follows:

My name is James Jackson. I reside in Hazelton, Kern County, California. I am a driller by occupation. Am not in that business at present. I went into the oil business in 1876 and I have been drilling for the last eighteen years. I have used underreamers principally. Have used Wilson reamers a little and have used the North reamer a little. I used the North reamer in the Santa Maria field in a well known as the Newhall well. W. O. Maxwell was superintendent there. Think it was in about 1905. We put the reamer in the hole; I believe I put the reamer in the hole myself. I ran the reamer that morning. I cautioned the man to ream slowly [432] with the reamer and he pulled it out in the afternoon and the cross-bar was bent. I ran it again and when I pulled it out it looked to me as though it was unsafe. We had the tee bar

(Testimony of James Jackson.)

straightened out at the Union Oil Company's shop at Orcutt. We ran it again. I broke one lug off and the reamer stuck in the casing and we had to remove the casing in order to get it out. After that we got a Double underreamer. I would not be willing to run a North reamer in a well hole again. Have never seen a North reamer since that time. It was not a practical reamer in my estimation.

I have *tied* both Double and Wilson cutters in running in the hole. I have never used the old style Double but very little after the new style came in. The new style Double is the strongest reamer. The V-shaped grooves brace the cutters better. Don't find much difference in the spread of the two reamers. If you underream with the loose string of tools you are more apt to Keyseat the hole. The idea that a driller on the surface can turn the tools by twisting the rope is an old exploded theory. There is no definite control of the string and the tools. The only safe thing to do is to run with the tight string of tools, a tight line and the tools are bound to turn. There are men who will ream three feet to my one but I always make it a point to ream the hole thoroughly so that the casing will go down. I never broke off a set of lugs yet and I have run the Double reamer quite a bit and I have run all sizes from 13½" to 6"

In drilling a man will make twenty-five feet or thirty feet and then put in the reamer and enlarge the hole. That gives a chance to clean out the bottom. He then can ream only twenty-five feet or

(Testimony of James Jackson.)

so, enough for a joint. A sticky formation is apt to "ball up" the reamer. The underreamer shown in circular marked "Defendant's Exhibit Union Oil Tool Company's Circular of North Improved Underreamer" is, I believe, the North reamer I used, under W. O. [433] Maxwell in the Santa Maria field.

I prefer the new style Double reamer to their old style. The broad cutters are an advantage as it cuts the bigger surface. It gives more metal also to the cutters. The cutters will last longer. Well, the only difference in my estimation is that a man could ream faster and safer with the new style than with the old, and it would stand more punishment. The V-shaped slots interlock the cutter and the body and better braces the cutters. With the broader cutter you might not ream the hole any faster but you would be sure of reaming a better hole. There would not be so much danger of key-seating with the broad cutters, but at the same time, a man will key-seat with them if he runs loose enough. It is a question altogether of how a man runs, in my estimation. I think it is an advantage to the new style double reamer to have the side extensions on the cutters back up against the surfaces on the body below those dovetailed grooves, and brace them. The cutter is braced on its inner face, braced on the side extensions of the double reamer body, is stronger and is an improvement, yes. They are braced on those flat surfaces on the body of the Double improved reamer which are machined flat beneath the dovetailed grooves.

**Testimony of W. G. Henage, Witness Called on
Behalf of Complainants in Rebuttal.**

Mr. Henage testifies as follows:

I reside in Maricopa. Age about 58. Am an oil well driller by occupation. Have been in the oil business since the eighties. I have used underreamers. The first reamer I used was an Austrian underreamer. If we would strike something hard we would either break off the dogs at the hole where the pin goes through or we would bend the pins. If the pins were bent the reamer would not be serviceable. As a practical tool to run a stem on, as we do nowadays, they wouldn't stand it at all. You couldn't ream with [434] them because you would break them the first time you got on anything that was hard enough to ream. It would either break or bend the cutters. I am acquainted with Tom O'Donnell. Have been on the property he was operating. Have seen him drilling. I never heard anything about an underreamer which O'Donnell is supposed to have had in Los Angeles. Had there been one there I certainly would have seen it. We never used an underreamer there because we had never any occasion to in the field, near the city of Los Angeles. While in Ventura we used an underreamer known as the Day underreamer. I think we secured it from Joe Austin. It was called the Day & Austin or Eastwood reamer. He was the manufacturer of drilling tools at that time, in San Francisco. The lugs or cutters were about three feet long and there was a mandrel inside of it and passed through it which

(Testimony of W. G. Henage.)

had a spring on and a block at the end of the mandrel. The spring was opened and exposed. We used it on a well about 400 feet. That was the amount of work it done. It was not satisfactory to us nor to any of the companies. We could not ream. It took us so long to ream that we naturally wore it out. It would drive and stick when you put any weight on it, and the stems used in those days were about 31½ inches in diameter and 18 and 20 feet long. That would be a very light stem. We succeeded in finishing the well in which we used this Day reamer. Well, we wore it down and reamed it with this reamer, what we could. We had several breaks on it. One thing that would break frequently was the spring. This was due to the reamer sticking and the tools working would strike the block up against the spring and get the cutters sticking in the hole. Naturally, when you would ream the hole, and it was sand rock there mostly, the cutters would dive down in it. They were narrow and the cutting surface was small on them and they would dive ahead, and as the tools came up, it would contract the spring and the spring would become crystallized and all broke to pieces. We finished that well with it and then it was thrown out and then we drilled three more wells in that vicinity, but we never used it afterwards because we considered it [435] a failure as far as a tool was concerned. We drove the pipe afterwards on those other wells. Those lugs would bend sometimes. They would come out twisted around * * * bent, * * and there was den-

(Testimony of W. G. Henage.)

ger of leaving it in the hole, and it took so long to underream with it that the company concluded they would not use it any more and threw it out. Defendant's exhibit small working model of Day device looks something as I remember the Day underreamer looked.

Sometimes in taking it out of the well these lugs were twisted around and in diving you see it would come together there and spring out here. That is the weak end of it, and you can't make it strong, because if you would make it strong it would be so stiff that it would not ride down in the casing. The spring would break frequently. Based on our experience with this Day underreamer, I would call it impractical as an underreamer.

The next reamer we used was the Austrian underreamer. The Austrian underreamer will underream but it would not be practical if a man would figure on doing work or had to do a certain amount of work in the practical way as we do at the present time. It was the best that we had in those days, but a mere makeshift. After the Austrian underreamer we used the Double reamer. There has been a demand for underreamers since they commenced to develop oil in California. The first reamer I used was the Lane reamer and that was about 1888. They were drilling a well for the Government at Vallejo or Mare Island. If I recollect we bought it of the Saint Louis Vise and Tool Company.

A. Well, it wouldn't stand no hard work. The lugs of that reamer was so long—they were about five

(Testimony of W. G. Henage.)

feet long—and they had to be that length in order to be springy enough—and the consequence was when you put the tools on heavy enough the lugs would give way, and those lugs were bent to the body of the reamer, and that wouldn't work. In a short time the bolts and the other lugs would break when you put too much weight on them. They had to be long to get spring enough to get them in and out of the pipe. [436]

Asked when it was that he first got a practical underreamer in California, and what that reamer was, the witness answered: I believe the first I used was in 1903 and '4. It was the Double reamer. The Double is the only reamer I have used since then.

(Asked as to which of the types of the Double reamer the witness prefers, witness answers:) Well, I couldn't tell you the difference in them. I can't tell you the difference between the reamer that I used in 1903 and '4 from the present underreamer. I don't know as I ever noticed any especial difference.

We did considerable reaming with the Austrian reamer. We lowered the casing.

I think the Day reamer would stand more than the Austrian.

Q. 64. Didn't you find that the provision of shoulders on the body of the Day reamer to take the up-thrust or end-thrust of the cutters was an advantage over the way the dogs of the Austrian reamer were mounted and worked?

A. This reamer here, you understand, in reaming a hole that is drilled before it, the pressure is against

(Testimony of W. G. Henage.)

the side. Now, when that comes down in and presses in, it will pull that dog out—pull this part out here—and when you spring it together you throw it out here. And when the hole is open ahead and you are cutting a rock there, whatever you drive in there—it has a tendency to come into the center of the hole where it would get the hard surface, and consequently cause that to stick. There is no support here to these dogs to keep them from springing in.

Q. 65. The pressure, then, in reaming is in on the dogs?

A. Yes; to a great extent it is inward. It is inward, yes.

The cutters of the Day reamer are almost vertical when in reaming position. I would not prefer the Day reamer to the Austrian reamer, because it is a dangerous tool because of this being open, and I know in hard rock it will stick. There is nothing to this spring, and it works like a jack-knife. (Witness illustrates by taking model of Day device in his hands and working [437] the bits or cutters up and down). I would rather have the Austrian reamer to work with. I think the vertical position of the cutters is the best. The cutters of the Double and the Day work on end, hence there is a breaking strain on the Austrian which they do not have, as the Austrian cutters work extending at right angles; the bend is sideways on them.

Q. 85. Then, in that respect do you not consider that the arrangement of the cutters in the Double and the Day is preferable to the arrangement of the

(Testimony of W. G. Henage.)

cutters in the Austrian? I am asking now only as to that one respect.

A. The arrangements of the Double, I think, are very good, because they have a protection so that they stay in place and take the thrust, while this has no protection whatever. (Witness, in giving this last portion of his answer, picks up "Defendant's Exhibit Small Working Model of Day Device" and moves the cutters crosswise of the body of the model.)

Q. 86. Well, you are still getting outside of my question. What I want to ask about and all I want to ask about just now is whether you do not consider the arrangement of the cutters of the Double and the Day—

A. Well, I can't see any comparison.

Q. 87. Just wait a minute—

A. I can't see where there is any comparison about the cutters of this, the way they are put on that reamer, and the other reamer. There is nothing at all the same about them as far as I can see. (The witness picks up "Defendant's Exhibit Small Working Model of Day Device.")

It was in 1890 or '91 when I used that Day reamer. I twisted the lugs several times. It came out twisted around and I took them off to straighten them. I didn't break anything except the springs. These were so light that it would not stop pulling it out. The reins are so light that it was bound to spring. A man pulling tools would be bound to pull that down and strain it so [438] as to pull it out. I don't believe that you could make this with those long reins

(Testimony of W. G. Henage.)

so that it would stand work.

Q. 123. Now, in order to prevent side play in the cutters of the Day reamer, would you not consider it possible to put dovetails on the sides of the body above the enlarged cutter portions, so that they would hold the reins above the enlarged cutter portions, and thus prevent that side play, and would that not prevent that side play, in your opinion?

Mr. LYON.—Objected to as incompetent and not a part of the prior art, no part of the Day device or alleged Day invention, irrelevant, immaterial, and being an attempt at a theoretical modification and re-arrangement of the prior invention, and an attempt to build up a prior art which did not in fact exist prior to the invention by Double of the device in the patent in suit and, therefore, totally inadmissible to prove any defense whatever, and, further, not cross-examination.

Mr. BLAKESLEE.—As to the prior art, in so far as it concerns dovetails in underreamers, the record will speak for itself.

A. I don't believe that you could make this here with these long reins so that it would stand the work.

Q. 134. I have asked as to one particular point.

Mr. LYON.—The same objection.

A. Suppose you made this solid up here. It wouldn't work, because this head wouldn't pull down. It could neither expand nor contract if it was solid. Here is where the weak part of it is. And if you protect that by grooving it would be solid.

(The witness in this last answer points to the reins

(Testimony of W. G. Henage.)

above the enlarged head of the body portion of the Day device.)

Q. 125. (By Mr. BLAKESLEE.) Supposing you put extensions on the body below the spring in the Day reamer which projected outwardly, so as to inclose the reins between them at both sides. Would you not consider this would be satisfactory in preventing side play of the cutters? [439]

Mr. LYON.—The same objection as last noted on the record.

A. It would stop the side play, but it would not strengthen your reamer, as here is the weak part of your reamer. (The witness points to the reins.)

The Day reamer never stuck in the casing. I don't know that I would consider the North reamer a tool that I would care to use; a man could get along as we could with the Day reamer in its day. We did not accomplish anything with the North reamer. At the time when I went there with the North reamer there was a considerable of a string in and I undertook to underream, but I could not underream with it. The reamer would stick and the dogs pulled in and out, and we worked with it some little time, and our pipe was getting pretty logy, or tight, and consequently we quit using it and put the pipe in and put a string of $5\frac{5}{8}$ and bought a new Double underreamer and finished the hole with the Double underreamer. After attempting to use this Day reamer we went back to driving our pipe rather than attempt to use the Day reamer further. We tried to underream with the North reamer, but it did not accom-

(Testimony of W. G. Henage.)

plish anything with it. We worked a couple of days with it. The main trouble with it was what we called "jack-knifing." The cutters would work in and out of the reamer. That is, it would open and shut. The shells are very hard and we did not make a success of reaming through it.

**Testimony of H. H. Maddren, Called as Witness on
Behalf of Complainants.**

Mr. Maddren testifies as follows:

My name is H. H. Maddren and live near Maricopa, California. Am connected with the Kern Trading & Oil Company. Am field superintendent. Our company is using Double underreamers at present. We have used Wilson reamers. I believe those Wilson reamers were [440] still in service of the Company when they were transferred to this field. The reason they were transferred from that field was we found that the Double reamer gave us better service than the Wilson and we made a standard of the Double reamer. The Wilson reamers were shipped to McKittrick, as the property we have there is very shallow and does not require nearly as much underreaming as it does either at Coalinga or here. At Coalinga on several occasions we abandoned the use of the Wilson reamers and got Double reamers to finish a well or two. We had a great deal of trouble with the cutters breaking off the Wilson reamers and also the mandrels which support the cutters. We broke some Double cutters, but we broke so many more of the Wilson cutters, and the cutter being contracted the way it was, it left a great deal harder

(Testimony of H. H. Maddren.)

pieces of steel in the well to fish out than it would in the Double cutter on account of being constructed differently. From my own experience, I should judge we broke several dozen sets of Wilson reamer cutters. We have not been troubled with the Double cutters breaking except in the very small reamers, such as in the $4\frac{1}{2}$ " reamer. We have had a good many of those broken, but probably not more than a dozen sets of either. I cannot state exactly, but I should judge we broke a dozen of the mandrels of the Wilson reamer. Most of the cutters that were broken are still in the holes and probably drilled up. It is very seldom that we were able to fish any of them out. But the shank of the cutter or the small end that remained in the bowl and the mandrels, they were usually thrown into the scrap heap and disposed of as scrap or junk. I don't know as they could be found now because our junk is being continually cleaned up and disposed of.

A. I always thought that the Wilson cutter was constructed on bad principles. That is, the lower part of the cutter was rather wide compared with the shank that holds it in the bowl. And also the manner in which it is held in the bowl. The top of the shank being the only part that receives the blow of the tools [441] when you are reaming, and the shoulders not being up against the bottom part of the bowl, it always appeared to me that that was very poor construction and was the cause of a good many of them breaking. Of course, I don't know anything about the class of material they made them

(Testimony of H. H. Maddren.)

of. That might have had something to do with it. But we had no way of telling what steel they used or anything of that kind. The Wilson reamers we had used and had had trouble with were probably purchased four or five years ago. I would prefer the Double underreamers having the narrow cutters.

A. I think it gives you more clearance and your underreamer will turn better in the hole and cut better. It is not as hard to dress as the wide cutter is. In fact, I think they are more satisfactory in most every respect. Besides, you have less danger of breaking a cutter off when it is built narrow. The first Wilson reamers give trouble to disassemble or assemble on account of the screws which hold the block in place.

A. Well, I couldn't say as I prefer the old type reamer to the new, if you take it clear back to the first reamers that were made by the Double people. There have been a good many improvements made over the older reamers in the new reamers aside from the cutters themselves.

Q. 34. Do you remember at what points the breakages took place in the Double cutters?

A. They usually broke near the eye of the cutter where the key goes through the cutter.

Q. 35. Did you have any other difficulty with the Wilson reamers than the breakages of the cutters and mandrels?

A. The first underreamers they made there were a good many difficulties. For instance, in unscrewing the set screws they had screwed in the sides of the

(Testimony of H. H. Maddren.)

bowl to support the mandrel and cutters and also the pins that went through the part of the bowl, we had lots of trouble in driving out the key that went through the cutter [442] and the mandrel. In fact, we had so much trouble from that source that we lost a great deal of time in drilling wells in taking off the dull cutters and replacing them with sharp cutters that were just dressed—we had so much trouble and loss of time, that very often they had to be sent to the shop and taken out.

Q. 38. Have you ever had any trouble with Double reamers due to their becoming worn down at the lower end of the body below the slot?

A. Yes; we have had underreamers that were used until they were worn out. It is just a case like any other piece of machinery. They were used till they became worn and we replaced them with new reamers.

I have never had any trouble with the joint in the body of the double reamer between the body and the sub, except lots of times when we wanted to take it apart and put in a stronger spring, or something of that kind, I would have a hell of a time breaking the joint so as to get it unscrewed. It is a large joint and pretty hard to break sometimes. That is a damn good feature. I would not call it trouble. That joint is not broken very often, and when it is set up good and tight it will stick. I did not consider it an advantage to be able to take the cutters off the Wilson reamer at the bottom without the necessity of taking off any sub. I would prefer to

(Testimony of H. H. Maddren.)

have a tool with a joint in it. It is a great deal handier in replacing that spring or the mandrel. You can break the tool in the middle and take the mandrel and spring out, and that is a good deal handier than taking it out of the bottom like you do in the Wilson. [443]

**Testimony of E. L. McCray, Called as Witness on
Behalf of Complainants, in Rebuttal.**

Mr. McCray testifies as follows:

I live in Hollywood, California. I am acquainted with Tom O'Donnell. I have known him ever since he was born. I am related to him. I am a cousin of his, his mother and my mother are sisters. I commenced to work for the Union Oil Company in 1887. I continued in the oil drilling business until 1896, when I got paralyzed. I have drilled in Bakersfield since then, but no active work around the well. I have had charge of leases. I worked in the Los Angeles field in 1900 and 1901, for six or eight months, possibly a year. During that time I saw Tom O'Donnell practically every day. I was right alongside of him. I have been on the property of the Whittier Consolidated Oil Company, in the Los Angeles fields at the wells that Tom O'Donnell was drilling there and while he was drilling. I was not any more familiar with the tools that Tom O'Donnell was using on those wells than I would be with any other tools except in the derrick. I generally noticed pretty close what tools he was using, but I never examined anything very closely about them. I had all the opportunity that a driller would have to have known

(Testimony of E. L. McCray.)

whether Tom O'Donnell had the O'Donnell and Willard reamer there to the extent practically of using the tool if I had occasion to. We never had occasion to use a reamer in the Los Angeles field, or very seldom, and I don't remember of seeing an underreamer used in that field. We had little or no occasion to use underreamers in the Los Angeles field. We did use them some, yes. I used an underreamer they called the North underreamer. I got it through Fairbanks-Morse Company of this city. The circumstances of my getting the North reamer were as follows: I had a $9\frac{5}{8}$ casing in my hole, about 600 feet of it, and I went down 600 feet below that and got a cave, and I wanted to put this casing down through that cave. I went down to Ed Double of Santa Paula, when he had [444] charge of the Union Shops, to get a reamer—to get what was called a Double reamer—and he only had a few of them made and there was none that I could get hold of, and I had to go to Los Angeles to get one, and I got one that they called the North Reamer. I could not do anything with the North reamer. We had no success with it. We could not get it to open or stay open after getting in the casing. I couldn't get the reamer to stay open. It would get clogged up and hold itself. There was nothing between the bits or lugs in the North reamer to hold the bits in expanded position, and in underreaming these bits would close in together and the mud and stuff would hold them in that position, and we would pull them out and clean them and put them back in again, and after a few revolu-

(Testimony of E. L. McCray.)

tions they would be in the same condition. I got no satisfaction out of it whatever. The North reamer I refer to was like the North Patent No. 674,793.

(Witness is shown "Defendant's Exhibit Union Oil Tool Company's circular of North Improved Underreamer" and asked if he ever saw an underreamer that looked like that). I seen several of the Union Oil Tool Company's underreamers. I have seen lots of underreamers like these, but I don't know whether they were Union's, or whose they were. I didn't follow the oil business in those days at all. There is nothing in that picture that looks like the reamer I referred to as the North reamer which I used in 1905 or '06. I don't remember of Double ever telling me anything about a North reamer.

**Testimony of W. M. Hill, Called on Behalf of
Complainants, on Rebuttal.**

Mr. Hill testifies as follows:

I am a member of the firm of Barlow & Hill of Bakersfield. I am interested in the wells on Section 29, 11, 23. My driller is Jack Bennett.

I produce a letter written by Jack Bennett to my firm, dated Oct. 26th, 1912, which refers to the loss of a 6" bit in that well. [445] This letter is as follows:

"Dear Chas:

"We are down 3850 feet and have lost a bit in hole which is liable to give some trouble as it lays over in the wall and we cannot seem to straighten it up, but may get it yet.

(Testimony of W. M. Hill.)

“Pipe is at 3842 feet and we dare not move it now on account of cave on bit.

“Will let you know as soon as we get bit out.”

We also have a letter in the handwriting of John A. Bennett, our superintendent or driller, under date of Nov. 21, 1912, addressed to our firm in which he says:

“Dear Chas:

“We pulled pipe and got bit all right; it was bent so badly it would of spoiled the whole string of pipe if we hadn't pulled it, as it was we ruined the three bottom joints.

“We have in about 1400 feet and hope to get it all back by tomorrow evening, but we are tightening all the collars as we go along and it will take a little longer.

“I do not expect any further trouble from the lost shoe now that we have bit out of the way.”

The 6" casing used in that well was purchased from the Oil Well Supply Company, their invoice dated March 7th, 1912. This is indiscriminately referred to as 6" and 6 $\frac{1}{4}$ " casing. I have a letter from Mr. Bennett dated March 11, 1912, in which he states that “The pipe arrived to-day and we have about 700 feet at the well to-night and will finish it to-morrow.” We landed the 8" casing in the hole about 2,770 feet deep. That hole is not yet completed. The 6 $\frac{1}{4}$ " casing was landed at about 3,995 feet. I have known Mr. Bennett for about 11 years and believe him to be absolutely truthful. He is a painstaking man very

(Testimony of W. M. Hill.)

careful and a very successful driller.

The formation in the Sunset Security well to which I have just referred are very hard. Some of the formations are very hard. [446]

**Testimony of Charles S. Off, Witness Called on
Behalf of Complainant, in Rebuttal.**

Mr. Off testifies as follows:

My age is 47; am an oil operator and producer. Residence 104 N. Union Avenue, City. Have been in the oil business for (17) seventeen years. I am familiar with the use of underreamers and have had occasion to use them. I am familiar with the Plotts underreamer, the Leidecker underreamer, the Austrian underreamer, the Double and the Wilson. Also am familiar with the North reamer. Attempted to use the North reamer at Whittier.

After entering the Whittier field we found our formation there stands almost upright, almost perpendicular, making the shells also stand almost perpendicular. It was very difficult to make a perpendicular hole there. In fact, we were unable to do so without the use of an underreamer. The first one I attempted to use was the Austrian and even with great care it would break off the lugs about as fast as we would put it in. I next had them try the Plotts underreamer which held its own. We had very little breakage, but the results were very unsatisfactory because it took so long to accomplish anything with it. We had one shell in No. 3, and on No. 3 we used a Plotts underreamer for five weeks in one particular

(Testimony of Charles S. Off.)

place trying to get it rounded out for the purpose of putting the casing through, and while using that during that time I took out a North underreamer. The drillers condemned it before trying it. They said that they wouldn't use it and went on to state what the particular weak points were that caused them to object to the use of it. So I finally induced them to try it and they tried it for two days with great care and accomplished nothing with it. Then we tried the Plotts again and finally got the Double underreamer and did the work in about five hours with the old style Double. [447]

I am familiar with the O'Donnell and Willard underreamer. The El Moro Oil Company well was drilled by my brother-in-law, R. A. Moranville. The El Moro well was about three-quarters of a mile from my property. I met Tom O'Donnell of Los Angeles, California, in the Whittier field. I know of the attempted use of the O'Donnell & Willard reamer at the El Moro well. At that time my brother-in-law told me he had tried the O'Donnell & Willard reamer and that it did unsatisfactory work, or, in fact, did not do any work; that you couldn't make it do satisfactory work. I saw that underreamer. It was hauled or rolled down onto our property and we had a team take it from that point—had it taken away. We had use for an underreamer at that time. We talked with Sam Frampton and Tom Frampton, my drillers, in regard to it at that time. Mr. Frampton refused to use it. My brother-in-law, Mr. Moranville, died about four years ago.

(Testimony of Charles S. Off.)

After first going to Santa Maria field, Tom and Sam Frampton drilled a well known as well No. 1 on Wright's Ranch Oil Company. It became necessary to use an underreamer and I understood there was a Leidecker there and, not being able to get a Double reamer handily or to get a Double reamer at that time, we used the Leidecker several times. The work was not successfully done with it, and we got a Double underreamer and continued our work with it.

Prior to getting the Double reamer there was great necessity for the use of an underreamer in California. From my experience with the Austrian reamer I would state that it was not a success for the reason that the formation stood almost straight, the shells being very hard and they would break off on the lugs. The face seemed to be too wide for the shank or the shanks too weak for the lug, and it broke off. I would say that I found the cutting surface was too great for the shanks, making the shanks weak and causing the cutter to break. [448]

It was my intention to use the Wilson underreamers if possible in the Maricopa field, and I ordered the Wilson underreamer for use in California Diamond B X, 8¼ casing—28 pound casing. When the underreamer arrived it was impossible for us to get it to properly enter the casing. I sent word to the house at Bakersfield that the underreamer was unsatisfactory and that we couldn't use it—that it wouldn't enter. So they sent a young man out—a representative—who, they stated at that time, would show

(Testimony of Charles S. Off.)

us how to use the underreamer. He came out there and he was at the well for two days and part of a third day, during which time it was impossible for him to get the underreamer to enter the casing. That is, to go down into the well. It would go down sometimes fifteen or twenty feet and it would catch and wouldn't go forward, and we would bring it back. We finally got it down to about 400 feet after three days more trial. Then we took the underreamer off and informed the people at Bakersfield that we couldn't use it and that we would return it, which we did. I got a Double underreamer and finished putting down the 8 $\frac{1}{4}$. I got the underreamer for the purpose of putting the 8 $\frac{1}{4}$ down. Then when we—I will have to make a statement that I am not positive whether it was a 10-inch or 8 $\frac{1}{4}$. I used two underreamers. I got the first one and it didn't work satisfactorily, and then I ordered a second one. I came down to the Wilson & Willard factory and had a talk with Mr. Wilson or Mr. Willard, rather, explaining to him the trouble I had had with the first underreamer, and I notified their man to get the underreamer down, and in giving the order for the second one I made especial mention of the fact that they should so construct the underreamer that it would enter the casing, and in place of doing the work the underreamer came up there and we tried to use it and we had the same trouble with it. We couldn't get it to enter or go through the casing. [449]

It was Diamond B. X. casing. I had used Wilson

(Testimony of Charles S. Off.)

reamers previous to that. I had had no trouble with the Wilson reamers before in entering the casing. Possibly the reamer which gave me trouble was not constructed right in the lugs and too much metal in the lugs or cutters. As far as I know the Wilson reamer is a successful reamer.

We had no trouble in getting the Leidecker down into the casing or out of the casing. My recollection is that it did not ream the shell.

The North reamer which we used in 1902 and '01 did not do the work satisfactory. I cannot state particularly what the reason. We did get some service out of the Plotts reamer. I have used both the old style and the Double improved reamers. I prefer the old style. It has a little less cutting surface, giving the upper part of the cutters relatively more strength. I do not think the increase of cutting surface in the latter type of Double improved an advantage in itself. It weakens the shank and I find in the formations that we have to encounter that the former pattern—or rather that with the cutting surface is more satisfactory and not so apt to mud up as the latter pattern of Double reamer. The calf wheels and the wire rope in handling is of very considerable importance and an advantage. It saves time. It would be practically impossible to put down as deep wells as we do to-day with the old style of light casing. Heavy casing is absolutely necessary in present day heavy drilling. All the other factors, namely, the calf wheel, the wire line, play an im-

(Testimony of Charles S. Off.)

portant part in deep well development. (After cross-examination witness is asked to step into the next room where he will find the exhibits in this case and see if he can find therein anything like the O'Donnell & Willard reamer which he says was tried in the El Moro lease. Witness puts his foot on the body of the "Defendant's Exhibit O'Donnell & Willard Underreamer.") That looks like the one. [450] Referring to the reasons for the continuance of the use of the Plotts underreamer by the Murphy Oil Company, I believe the reason for their having used the Plotts' underreamer the length of time they did, was because Mr. William Plotts, its supposed inventor, was manager and superintendent of the Murphy Oil Company for a number of years and, therefore, endorsed his own instrument by using it. I remember the drillers of the Murphy Oil Company making complaint of the Plotts' underreamer.

**Testimony of Chester W. Brown, Witness Called on
Behalf of Complainants, in Rebuttal.**

Mr. Brown testifies as follows:

My name is Chester W. Brown, residence 204 Union Avenue, Los Angeles, age, 44, occupation, manager of the field department of the Union Oil Company. I have been in the oil business since 1887. I started as tool dresser. I worked in connection with the drilling of wells in Ventura County, California, until 1894, then went to Los Angeles and operated in the Los Angeles fields, and from there went to Peru, South America. Am familiar with under-

(Testimony of Chester W. Brown.)

reamers and their use. The first underreamer we attempted to use was the Day underreamer. We used or attempted to use that reamer on well #3 on the Astarta Oil Company in the Ojai District, in Ventura County in 1890. Beside myself working on that well was Homer Hennage, E. G. Chamberlain, John McGee, I was tool dresser at that time.

We endeavored to use this reamer to carry our string of 55 $\frac{5}{8}$ casing, as I remember the size; but we were continually breaking it, losing parts of it in the hole, and finally—I am just trying to remember whether we used that to a finish on the well or whether we drove that the latter part. I think we did. Finally resorted to driving our pipe instead of trying to underream. [451]

I produce the original book of logs of the wells drilled at that time; these wells now being the property of the Union Oil Company, and the book being a part of its records. Subsequently to drilling this Astarta well I drilled other wells in Ventura County, but did not use this Day reamer. We drove our pipe. In 1891 we used the same reamer in the Bardsdale field, in Ventura County on well #1. It was a failure. The rock being harder, we broke the mandrel and lost the stem in the well expanded. On the log of that well I notice the following:

“At 1060 feet an attempt was made to run an underreamer, but the keys broke and left half of it in the well expanded.” That refers to the Day reamer. We drove our pipe after that. I consider the Day reamer too frail to be of any consequence.

(Testimony of Chester W. Brown.)

On Cross-examination.

(By Mr. BLAKESLEE.)

Q. 33. Where are the keys of the Day underreamer which you have referred to as broken in 1891 in operation?

A. I have not referred to them as keys. This is the old record made up by the engineer then. I presume that he perhaps refers to this that I would call the mandrel as the key, which works through here.

Q. 34. My recollection of your record is that it refers to "keys" in the plural. What two or more parts could your record refer to in this Day reamer?

A. Well, I couldn't say, because the record is made up not by myself, at this time. It is kept by an engineer, Fenn, and I only remember this in a hazy sort of a way, that we lost the underreamer in there expanded and had no way to fish it out.

Q. 35. Is your recollection of the construction of Day reamer itself equally hazy and do you rely upon the model which had been submitted to you for examination to make certain the [452] construction of this reamer?

A. No, sir. Quite to the contrary, I remember it very well. It was one of the first run in the fields at that time.

Q. 36. Where did you procure this Day reamer?

A. I don't know. It was sent to the field by the manager for us to run.

Q. 37. Of your own recollection, then, you cannot point out on this Day model the parts referred to in

(Testimony of Chester W. Brown.)

your record as "keys" which your record states were broken? Is that correct?

A. No; I could not. But, I would say that it was the mandrel.

I was present at the time the Day reamer was lowered into the 1891 hole when it was broken. Just the upper part of the mandrel comes out. That is the part which I think may have been referred to as the key. Right here I would say I am not sure as to the construction of the square part and the round, whether that was a solid body or whether it was, perhaps, fastened with keys at that point. The round part which is covered by the spring may have been connected by keys to the square mandrel which worked through the head. Our record shows that we were in red sandstone. That is a formation which I do not think is encountered outside of Ventura County. It is softer than the usual formation. We broke the Day reamer the first time that we used it. We never accomplished anything, we never lowered any casing through any hole that we reamed with it. The Union Oil Company, the company I am associated with, is affiliated with the Union Tool Company. In using the Day reamer in 1890 we used that reamer I would say for several weeks, during which time springs were lost and drilled up, reins were broken; the reamer was sent to the shop to be repaired, and we always drove the pipe that followed our operation of underreaming. With the weight of stems and tools we use now-a-days, I don't think the Day reamer

(Testimony of Chester W. Brown.)

would stand half a dozen blows. We thought it reamed in places and then in other places where the rock was harder we thought it did not. As we drilled, however, the reamer advanced downwardly below the depth where we commenced [453] reaming. At the time of running the Day reamer if there was anyone that had had any experience running underreamers at that time it was Hennage. The record on which a log of the well on which the Day reamer was used was kept different from the way we keep them to-day. It was written out, after the wells were made by the drillers, and perhaps there were some things they forgot to put in. There is nothing on the record that shows where we began, nor where we left off, with the reamer. I would think that we reamed altogether over a hundred feet with it.

Our company is interested in the Lakeview properties in the Kern River field in which Mr. Charles Off is connected. It was my understanding that there was some common ownership of the stock of the companies of the Union Oil Companies and the Union Tool Company. We did not buy any more Day reamers and I never saw one after that. After losing this Day reamer in the Bardsdale well I think we drilled about ten other wells in that locality.

**Testimony of B. N. Youngken, Called as a Witness
on Behalf of Complainants in Rebuttal.**

Mr. Youngken testifies as follows:

My name is B. N. Youngken; age, 42; resident of Los Angeles; field superintendent for the Union Tool

(Testimony of B. N. Youngken.)

Company. Have been connected with the manufacture and sale of oil well tools and machinery since 1889. I was in the employ of a company in Santa Paula who conducted a hardware store, namely, the Santa Paula Hardware Company, and they also ran a machine-shop.

The machine-shop department was afterwards known as the Union Tool Company. I have been with that company for practically twenty years. Four years of that time I have been with other companies. Was with this company during 1889, 1890 and 1891. I repaired underreamers and am familiar with them. We repaired the [454] Day reamer. A portion of the upper part of the rein was bent and twisted. This lower portion, or the cutter, was missing. I put the reamer together after the new part was made.

I am familiar with the North Improved Reamer. I think Mr. Jones, the machinist in Santa Paula, showed me the model of that reamer. I next saw it being manufactured by the Union Tool Company's Shop of Los Angeles. W. O. Maxwell was in charge of the Recruit Oil Company.

I was very favorably impressed with this reamer as manufactured by the Union Tool Company at that time, and asked them to send me some reamers to the Orcutt shop, that I might push this reamer. They sent me three reamers to the Santa Maria field. One of these was used by the *Recruit* Oil Company, one by the Union Oil Company; the third reamer has never left the shop.

(Testimony of B. N. Youngken.)

Mr. Maxwell was the first to try out this reamer, to the best of my knowledge, in the Santa Maria field. They were both used very close together; the time of operation was very close. Mr. Maxwell took this to his property and the first that I heard of it going to the bad was when he came into the shop with the T-bar bent and had me straighten it. I straightened it and he took it back to the lease. And afterwards I think he called me up on the 'phone and told me that the reamer had fouled in the hole, and they could not get it out—when they got it out one cutter was broken and the bar bent again. I immediately had a new reamer sent from Los Angeles, of the Double pattern, to replace this reamer. Mr. Teatsorth's experience with this reamer was very similar, with the exception that I think he only ran it once and had to strip the casing or cut the line—had trouble or difficulty in getting it out—and never used it the second time. That, I am not sure of, but it is the best of my knowledge from what I can remember at the time.

Why, I would not try to dispose of the third reamer that I had there, under any circumstances at that time, being afraid to [455] let it go out. Later on, I had opportunities to rent other reamers, and not having any reamer—nothing but this reamer at the shop, I would laughingly offer to let them take this reamer and use it if they wished to but told them of the experience that I had had with the other two reamers and would advise against them using it; and I have also offered to give the reamer to a person if he wanted it. So far nobody ever accepted the op-

(Testimony of B. N. Youngken.)

portunity. The reamer is still at the Orcutt shop, with the exception of the sub or upper portion of it, which has been used for some other purpose. The body and cutters are intact as they came from the Los Angeles shop.

During my service I have repaired Wilson Underreamers, drilling out the bolt at the bottom and the retaining bolt the two short bolts which hold the block. Also have straightened the lower portions of the body where they have spread.

Well, the reamer is constructed at the bottom as a slot clear through the body, and thus has a tendency, in these cases of which I speak as repairing the reamers, to have spread outwardly sufficiently to cause the people using the reamer to be afraid to use them in that condition any longer and it was necessary to heat those and close them together.

I do not know of any Austrian underreamer in use in the fields. I have a recollection of, a few months ago, somebody asking me if I knew where he could get hold of one, and I told him I did not know where he could secure one. From the year 1902 on until about the middle of 1904 I worked in the shop. What I heard about underreamers was generally from men who came to the shop. I worked on Double reamers and other reamers that were brought to the shop for repairs. We made keys, etc., for reamers, I don't think I can give any particulars in detail as to what repairs were given Double reamers in 1902, 3 or 4, although that is twelve years later than the work I did on the Day reamer which I remember very well. During the years 1902, 3 and 4, I was not with the

(Testimony of B. N. Youngken.)

[456] Union Tool Company. At that time I was with the Webster Iron Works. I was also in a Shop at Santa Paula the name of which I think was the California Well Tool Works. I also worked a few months for the Bakersfield Iron Works.

The most breakage to Double underreamers is the cutters. The dovetails of the Double reamer bodies break also. I don't remember any keys of the Double reamer being broken in the last year. I don't say that there has not been keys broken during that time. Such breakages or reports of breakages are generally reported to me from the Los Angeles office. And it is my duty to inspect it.

I returned in 1904 to the Union Tool Company. About the last of August or September. The first that the new style Double Underreamer, namely, the Type as shown by "Complainant's Exhibit Double Underreamer," came to my knowledge while I was in Orcutt. I should judge that was in 1905. The first Wilson reamer I saw was brought by the Associated Oil Company or the Recrude Oil Company to Orcutt. That was in the latter part of 1905, I think.

During the last two years in which I have been visiting the Oil Fields regularly, I do not remember of having seen a broken Tee or spring-actuated mandrel of Wilson underreamer. Do not remember of ever having seen any broken Wilson underreamer cutters. On the other hand, I have seen broken Double cutters practically every trip I make through the fields. I saw a broken Double underreamer body on my last trip through the fields, the same reamer or

(Testimony of B. N. Youngken.)

reamers I have seen at previous times. I don't recollect of seeing any new breakage in the underreamer or cutters within the last two or three months. I possibly have, but I don't recollect just the exact incident right now. There are a number of broken Double underreamer bodies which I have seen in the fields during my last three months. The dovetails would be broken out of them. I remember seeing one Wilson underreamer body with the side broken off of it. I don't know whether you would call that the dovetail broken off or not. It was right through here. (Witness refers to [457] Complainant's Exhibit Wilson Underreamer No. 2 and draws his pencil across the projecting portion just above the bottom bolt and on a line with the square shoulders at the top of the side thrust-bearings for the cutters.) I have paid no attention to the breakage of the Wilson reamer and consequently could not answer those questions intelligently as to breakage of the Wilson reamers. I have seen several of them that were spread at the bottom. I would not say when or where. I remember one reamer that was brought into the shop. I never considered it anything new to have the Wilson reamer bend in that particular locality. I do not remember of seeing any other broken Wilson underreamer body. It was during 1906 or 07 that I saw a Wilson reamer body that was spread apart. It was heated and the prongs were closed together to the proper position. The Day underreamer and the Double underreamer both have cutters which expand over a central body. That

(Testimony of B. N. Youngken.)

body is fixed to a string of tools. I consider the Double underreamer like "Complainant's Exhibit Double Underreamer" has a stronger body than the Wilson. There would be a side strain on the Day underreamer cutters. Eliminating the upper-end of the cutter-rein, the upward thrust is taken on the body at the bearing of the V-shaped groove. The side on the cutters would cause a twisting or a corkscrew action of the reins. Based upon my experience as a machinist and in observing the use of underreamers, I do not think you could make the reins of this Day reamer sufficiently strong to withstand the reaming action without having the reins so stiff that it would be impractical inside of the dimensions, required. They would be so stiff that I should think it would freeze in the casing, like a casing spear. My opinion that the Double underreamer body is stronger than the body of the Wilson underreamer is based on the construction of the two bodies, not upon the breakages that have occurred to either one of them. I don't know which has the stronger dovetails not having measured them. I don't think the extended bearings at the lower end of the Double underreamer as shown by "Complainant's Exhibit [458] Double Underreamers," namely, the Double improved, in any wise braces the cutters against which tends to rock or twist. We sell more Double improved types than any other type.

(Copies of letters patent number 862,317 dated August 6, 1907, again offered in evidence, and same to be marked "Complainant Exhibit Double Patent No. 862,317.")

**Testimony of Thomas J. Griffin, Recalled on Behalf
of Complainants in Rebuttal.**

I have heard W. W. Wilson's testimony and also that of E. C. Wilson and I do not agree with them that the inclination of the dovetails on the Double underreamers is necessary to effect the expansion of the cutters or bits of the Double reamer. The dovetails of the Double reamer are inwardly and upwardly inclined, has nothing to do whatever with the contraction or expansion of the Double cutters. They are simply for the purpose of retaining the cutters in position, either sidewise or outward. They perform no function in the expansion or contraction. When the Double reamer is in reaming position and is being pinched in a hard shell or other formation and the upward movement of the tools takes place, as soon as the cutters begin to slide downward, the points of the cutters are allowed, by these upwardly and inwardly inclined dovetails, to contract at their lower points, thereby relieving the binding tendency on the points of the cutters, and the further down they come the greater contraction is allowed, until they come to the V-shaped grooves on their inner surfaces, and there it tilts over the spreading-bearing, allowing the cutters to completely collapse.

The initial relief at the ends of the cutters of the Double underreamer, and that of the Wilson underreamer cutters is identically the same. The principle of operation is identically the same. [459]

A. 277. In the Double underreamer body there is, on each side two dovetails that are upwardly and in-

(Testimony of Thomas J. Griffin.)

wardly inclined, allowing the cutters, as they pass down, to collapse or to begin to collapse on their downward travel, thereby allowing them to relieve themselves of any pinch or bind that may be occasioned by the dull bits. In the Wilson reamer body there are two sets, mechanically speaking, the same as in the Double, with the exception that they are parallel to the body. On the lower portion of the slotted extension of the Wilson reamer there is a taper-bearing, or taper-bearings, that engage with the inner surfaces of the cutters. The cutters, near the top ends of the shanks on their dovetails, are cut away to an angle comparing, mechanically speaking, to the bevels on the spreading-bearings of the slotted extension of the Wilson reamer, allowing a tilting action, and, as the bits or cutters are bound or pinched at the lower cutting surfaces as the tools are withdrawn from the hole and the cutters binding, as the cutters start down their plane or bevel surfaces and slide downward, the binding tendency is, similarly as in the Double, relieved. If, as is shown in "Complainants' Exhibit Wilson Reamer No. 2 T-bar," this upper portion of the dovetails on their outer surface were not cut away, they would not tilt over their spreading-bearing, nor would they have the same tendency to collapse at their lower portions, as the T-bar and thickness of the cutters up to and including their dovetails have simply a clearance movement, and if this portion of their dovetails was not cut away the cutter would slide out parallel to its original reaming position. Owing to the fact that

(Testimony of Thomas J. Griffin.)

the upper portion of the shank of the cutter is parallel with the axis of the reamer body, the dovetails being parallel to the axis of the body, the T-rod being parallel, there would [460] only be the slight rocking or shaking of the reamer lugs and they could not contract—as I will illustrate by placing the lugs upon the mandrel and forming a pressure sufficiently to carry the weight of the cutters at their upper ends, they would be bound, and not allowing them to come into their position, as there is about one and a quarter inches of surface above the fulcrum on the T, thereby binding it, and it would not contract.

The difference is simply a matter of changing the angles.

A. 279. The angles that I have referred to are on the lower portion commencing at the end of the wedge-shape bearing and continuing upwardly and outwardly to the square shoulder on the body. On the Double reamer this is inverted and is placed on the upward and inwardly inclined dovetails.

Q. 280. You state that in the Wilson underreamer, for example, "Complainants' Exhibit Wilson Underreamer No. 2," the thrust-bearings at the lower end of the slotted extension are inclined slightly upwardly and outwardly and that the dovetails of the body are straight, and have referred to the fact that in the Double underreamer these thrust-bearings are straight and the dovetails upwardly and inwardly inclined. In what manner is there any correspondence between these two constructions, Mr. Griffin?

Mr. BLAKESLEE.—Objected to as leading, and

(Testimony of Thomas J. Griffin.)

particularly in view of the assumption as to the function of the upwardly and outwardly inclined parts referred to as of the structure of the Wilson Underreamer.

A. Mechanically speaking, their functions are identical.

Q. 281. (By Mr. LYON.) What difference, if any, does it make in the principle of action or mode of operation or interrelation of the bits or cutters with the body of the reamer in collapsion [461] or expansion in inclining or tapering the dovetails and using a straight thrust-bearing parallel with the longitudinal axis of the body of the reamer, or inclining such thrust-bearings as in "Complainants' Exhibit Wilson Underreamer No. 2" and using a dovetailing which is straight and parallel with the longitudinal axis of the body of the reamer?

Mr. BLAKESLEE.—Same objections.

A. None.

Q. 282. (By Mr. LYON.) With relation to each other, are such surfaces, to wit, inclined dovetails and straight thrust-bearings or the straight dovetails and inclined thrust-bearings, in any different relation, so far as the expansion and contraction of the bits is concerned? If so, state what that difference is.

Mr. BLAKESLEE.—Objected to as leading; and it is submitted that the inquiry as to what relation exists would be a more proper inquiry, with respect to such objection.

Q. 283. (By Mr. LYON.) In view of the objection, and to obviate the same, I will ask Mr. Griffin to

(Testimony of Thomas J. Griffin.)

state what these relations are of the surfaces that I have referred to.

A. I don't know as I just get that whole thing, it is so muddled up. The objection and the second question there has got me just a little bit off of the line. I will ask that the question be re-read.

Mr. LYON.—Read the last question. (Last question read by the Special Examiner.)

A. (Continuing.) Why, the relations of the surfaces to the “Complainants’ Exhibit Wilson Underreamer No. 2” and the Double reamer surfaces referred to, are identically the same—with, there may be a small difference in degrees of angle—and they perform identically the same function.

Q. 284. What difference, if any, is there in the manner in [462] which these surfaces in the two exhibits referred to by you perform said functions?

Mr. BLAKESLEE.—Objected to as leading.

A. The Double dovetails are upwardly and inwardly inclined and the Wilson is upwardly and outwardly inclined—a mere matter of degree.

Q. 285. (By Mr. LYON.) You have not answered as to its function, yet.

A. And their functions are identically the same one with the other.

Q. 286. And as to their manner of performance of those functions?

A. As to the manner of performing their functions, they are the same.

Q. 287. You have stated that the inclination of the dovetails in the Double underreamer performs no

(Testimony of Thomas J. Griffin.)

part in the expansion of the bits. Can you produce any device from which you can demonstrate this?

A. I can.

I produce a 5" Double reamer body with upwardly and inwardly inclined dovetails removed. This reamer with cutters was made at the Union Tool Company Works at Torrance. The bits which I have produced fit this body and the body is one of the regular manufacture of Double underreamers. The dovetails were removed under my instructions to demonstrate that the inner and upwardly inclined dovetails have nothing to do with the expansion or contraction of the cutters, and are simply for the purpose of guides.

The upwardly and inwardly inclined dovetails on the Double Underreamer body are for the purpose of guiding the cutters and preventing them from falling out or dropping out when the tool is in operation, and for the purpose of giving strength to corresponding [463] dovetails on the shanks of the cutters. This strength is to prevent the cutters, their upper ends or shanks, from coming out; also for the purpose of preventing the lower parts, or assisting in preventing the lower parts, next to the lower end of the shank, from swinging outward when the tool is in operation by them coming in contact with the inner faces of the upwardly and inwardly inclined dovetails and also the outward face of the dovetail on the cutter, thereby giving the reamer body, or the cutters, an additional amount of strength. "The coacting dovetails on the bits and body of the Double reamer brace

(Testimony of Thomas J. Griffin.)

or strengthen the reamer against outward strains, preventing them from spreading out.”

(The body and cutters produced by witness are offered in evidence as “Complainant’s Exhibit Double Underreamer with Dovetails Removed.”)

No changes of any kind have been made in the body or cutters of this exhibit, except to plane off the dovetails of the body. After having these dovetails planed off this exhibit I verified my testimony that without such inclined dovetails the expansion of the reamer would be the same. It is identically the same.

Q. 302. (By Mr. LYON.) What did you find, Mr. Griffin, after planing off the dovetails of the last exhibit produced by you, was the effect of the upwardly inclined dovetails, so far as the expansion of the bits was concerned? And I refer particularly to the principle of operation and coaction of the parts in expansion.

Mr. BLAKESLEE.—Objected to as indefinite, inasmuch as the exhibit shows that the dovetails have been mutilated or removed, eliminating any deduction as to what their action was.

Mr. LYON.—Just read the witness the question. (The last question was read by the Special Examiner.) [464]

A. Planing off the upwardly inclined dovetails, I found, by comparison, the upward or inward incline of the dovetails had nothing to do with the expansion or contraction of the bits, and their function was simply a guide or retaining mechanism or feature, as the inner surfaces of the bits at the upper ends

(Testimony of Thomas J. Griffin.)

of the lugs and the lower surfaces are parallel to the parallel slotted extension of the Double underreamer, thereby showing conclusively that the dovetails have nothing to do with the expansion or contraction of the lugs or cutters, and the only function, as I have stated before, is for the purpose of guiding the cutters in their upwardly and downwardly movements and giving strength thereto, preventing the cutters from being driven out at their lower points.

Q. 303. What difference, if any, is there in the mode of operation or principle of coaction existing between the body of the underreamer and the bits in the old style and new style, so called for convenience, of the Double underreamer as exemplified in "Complainants' Exhibit Double Underreamer" and "Defendant's Exhibit Double Underreamer"?

A. None whatever.

They play no part in contraction or expansion of the cutters.

The V-shaped grooves on the Double improved are placed there for the purpose of preventing—as a preventor, if needed, in underreaming. If the tools come in contact with such as a boulder, pieces of iron, or that the driller, as often is the case, reams his hole down below, or attempts to ream it below, his drilled hole, and gets on solid rock, or that he runs his tools in a crooked hole, and one of the lugs would be working free and the other lug would be digging into the wall of the crooked hole—in that event these V-shaped notches come into play; and also, if there should happen to be a boulder or hard

(Testimony of Thomas J. Griffin.)

[465] point of rock projecting from any cause at the side of the drilled hole and one of the lugs striking it and driving it outwardly from the center of the body and bending the cutter, or having a tendency to bend the cutter—that this V-shaped notch would be an assistance in the protection of the cutter. It does not come in contact, however, with the body of the cutter unless some accident happens thereto. And if the driller was running his tools slack and not holding them up, so as each stroke of the reamer would get the reaching or spring of the line effect, and working his tools, which is often the case, too heavy, having a stem, jars, and sinker-bar attached thereto, which is quite often an occurrence in this hard drilling—in that event he would have the tendency, or the reamer lugs would have a tendency, probably to spring out, and this V-shaped dovetail would be of assistance in preventing such spring, as, as soon as they begin to spring, the shoulder of the cutter would come in contact with the inner surface of the V-shaped notch.

Q. 306. (By Mr. LYON.) Mr. E. C. Wilson testifies that, “When the underreamer is in operation, probably the greatest force applied against the cutters, unless it be the actual end-thrust of the cutters against their bearings at the upper ends of their shanks, is the tendency to crush the lower ends of the cutters towards each other.” In the actual use of underreamers what have you found in this regard, Mr. Griffin?

A. Owing to the conditions in which you are

(Testimony of Thomas J. Griffin.)

underreaming. When the cutters are sharp and in good condition, the cutter has a tendency to dig out into the walls, and it would be right the reverse, as the angle upon which the bits are dressed have a wedge-shaped action on the surface drilled, as a chisel setting at that angle would dig into the wall, thereby having a tendency of spreading the cutters; but as the cutter becomes dull and run [466] too long, and *dubs* the cutting edge of it, the lugs then have a binding tendency and a tendency to wedge in toward the body of the reamer, throwing a great strain, or considerable of the strain, on the face of the central portion of the Double underreamer and against the lower portion of the slotted extension of the Wilson.

Q. 307. In your experience in underreaming, would you say that the greatest force applied against the cutters was thus outward, or inward?

Mr. BLAKESLEE.—If this question is based upon the quotation from the testimony of the witness E. C. Wilson, attention is called to the fact that the greatest stress of all on the cutters is admitted to be an upthrust.

Mr. LYON.—The statement of counsel is objected to as not evidence. If he desires to testify in the case he can be given an opportunity to do so.

Mr. BLAKESLEE.—And we object to the question as indefinite and misleading.

A. The greatest force is outward.

Q. 308. (By Mr. LYON.) And that has a tendency to do what with the bits?

(Testimony of Thomas J. Griffin.)

A. To spread the lower portion of the bit.

Q. 309. To spread the bits away from each other, you mean?

Mr. BLAKESLEE.—Both of the preceding questions are objected to as leading.

A. Yes, sir. [467]

**Testimony of Thomas J. Griffin, for Complainants,
Recalled in Rebuttal.**

Direct Examination Resumed.

(By Mr. LYON.)

Q. 310. Mr. E. C. Wilson has testified, in reference to the result of machining the V-shaped shoulders and grooves in "Complainants' Exhibit Double Underreamer," that it included, amongst its other effects, the extension of the spreading-bearings and thrust-bearings, and states: "This extension transfers the fulcrum or the point of contact further down on the cutters when the cutters slide or tilt over this spreading-bearing." Do you agree with Mr. Wilson? A. I do not.

Q. 311. Why not?

A. If I understand Mr. Wilson's answer, and the question, correctly, referring to this answer, the machining of the V-shaped notches on the lower end of the mandrel has not changed the fulcrum of the cutter, as the fulcrum of the cutter in the old style Double is substantially the same as in the new style with the V-shaped notches.

Q. 312. Referring, Mr. Griffin, to that part of Mr. Wilson's question and answer included in the pre-

(Testimony of Thomas J. Griffin.)

ceding question, in which he says "The point of contact" is transferred further down on the cutters by reason of this V-shaped notching, what have you to say? A. It has not.

Q. 314. In what manner has the cutting or utilization of the V-shaped notches in "Complainants' Exhibit Double Underreamer" in any manner affected the length of cutters or bits which can be used in the Double reamer?

A. The length of the bits, in either the old or the new type of Double reamer, can be lengthened or shortened and will still do their same work. [468]

Q. 317. Mr. Wilson, in his testimony, has referred to a tendency to "rotate the cutters in the dovetails," throwing the heavy outward strain at one side of the shank and an inward strain of the cutter on the opposite side of the shank," and states that, "it would probably have been altogether impractical to have widened the body of the old style Double underreamer cutter without some means of extending the bearings at the backs of the cutters correspondingly. This could not have been done with the old style Double underreamer cutter, as by that form of construction there was no point on the old style Double underreamer body on which said bearings on the cutters could have rested." What have you to say in regard to this?

A. I differ with Mr. Wilson as to the practice: First, by widening the cutters and not increasing the size of the shank has weakened the cutter shank. As to its rotative inclination, the dovetails of the

(Testimony of Thomas J. Griffin.)

cutter and corresponding dovetails on the body of the mandrel are for the purpose of preventing the rotation, and, when such action would take place, the force of that action would be against the dovetails on the body, ripping them out, which occurs in the narrow cutters correspondingly with the broader or wide cutter, and for that reason the V-shaped notch was placed at the bottom of the body, so as to take away the additional strain that might come if this accident or point of operation should occur; and, if such was the case, without the V-shaped notches it would have a tendency to rip the dovetails from the body.

Q. 318. Then, does the extension of the thrust-bearings laterally in any manner tend to counteract such tendency to rotate, where no supporting or bracing shoulder like the V is used? [469]

A. No.

Q. 319. In "Complainants' Exhibit Wilson Underreamer" or Wilson underreamer No. 2, what is there to counteract the tendency of the cutters to rotate?

A. The dovetails.

Q. 320. And where is such strain of such tendency taken up?

A. On the dovetails of the cutters and the corresponding dovetails of the body.

Q. 321. And where is such corresponding strain taken up in the old style Double underreamer, "Defendant's Exhibit Double Underreamer," and in the device as shown in the drawings of the patent in suit, "Complainants' Exhibit Double Patent"?

(Testimony of Thomas J. Griffin.)

A. On the dovetails of the cutters and corresponding dovetails of the body.

Q. 322. Then, if I understand your testimony, the extension of the flat surface below the V-shaped notches in "Complainants' Exhibit Double Underreamer" and the corresponding extension of the single flat surface on the inside faces of the bits to bear there against, has no effect in taking up this strain?

Mr. BLAKESLEE.—Objected to as leading.

A. It has no effect in taking up this strain, whatever, or assisting in taking up this strain. The V-shaped notch is put there for that purpose; as, when the bit or the reamer would attempt to rotate by striking on some hard substance on one corner or receiving a blow on one corner and attempt to twist, in place of throwing all the strain on the dovetails this V-shaped notch would assist in taking that up. I wish to add to that, that, in "Complainants' Exhibit Double Underreamer with Dovetails Removed" by shoving the cutter in the slotted extension up against the thrust-bearing, it having the dovetails removed [470] therefrom, you cannot twist this lug out of position, as it comes in contact with the V-shaped notches.

Q. 323. (By Mr. LYON.) I show you a body, and ask you if you have ever seen it before.

A. I have.

Q. 324. Please explain what this body is.

A. This is the lower portion of the body of a so-called Improved or so-called New Style Double 4½

(Testimony of Thomas J. Griffin.)

inch Underreamer with the slotted extension, or the outward portion of the slotted extension, including the dovetails, removed on one side; on the other side showing the dovetails in that part of the reamer intact, with the slot of the extension extending through the circle of periphery of the reamer body. It also shows the thrust-bearing that is used for the shank of the cutter, and receives the blow from said shank of the cutter. It also shows the spreading-bearing clear across the body of the reamer, and shows the slotted extension which is used for the key or a T-bar, as the case may be, and it can be increased in size to any desired width for the purpose of receiving a key of any desired thickness, or T-bar; and further shows the spreading-bearing over which the cutters expand and contract in their regular operation.

Mr. BLAKESLEE.—It is asked that all those portions of this answer which do not purport to be descriptive of this body under discussion itself, such as the statement, “It can be increased in size to any desired width,” be stricken out and withheld from consideration, as not responsive to the question, and as merely speculative.

Q. 325. (By Mr. LYON.) What was the object, Mr. Griffin, of machining away one side of the hollow slotted extension of this body?

A. To clearly demonstrate these points; and to further [471] show what function the dovetails of the body and corresponding dovetails of the cut-

(Testimony of Thomas J. Griffin.)

ters perform. Also, to show the width of the spreading-bearing.

Q. 326. What knowledge have you of the machining away of the one side of the hollow slotted extension of this body? A. I ordered it done.

Mr. LYON.—Complainant offers in evidence the body which has just been referred to by the witness, and asks that the same be marked “Complainants’ Exhibit Double Underreamer With One Side of the Hollow Slotted Extension Machined Off.”

(The exhibit last referred to and offered in evidence is marked “Complainants’ Exhibit Double Underreamer With One Side of the Hollow Slotted Extension Machined Off.”)

In order to illustrate my statement that the slot in which the key or head of the spring actuated rod moves vertically may be of any desired width I introduce herewith an old style Double 4½” reamer body. This number is 163, Reamer made in 1903.

Q. 335. And what changes, if any, have been made in this body in its condition as originally manufactured?

A. It has been placed upon the milling machine and the slotted extension, beginning at the lower portion or spreading-bearing, has been milled out up to the thrust-bearings, and a hole drilled in the lower portion crosswise of the slotted extension and a retaining-bolt with the nut on the opposite side placed therein.

Q. 336. And what does this illustrate?

A. It illustrates that the slotted extension can be

(Testimony of Thomas J. Griffin.)

increased in size to receive a T-bar or a key of any desired style or form or size; and also illustrates and demonstrates that the cutters will expand and contract over the spreading-bearing just the same as if the lower part of the central portion that [472] is now occupied by the pin hadn't been removed.

Q. 337. And what effect, if any, would it have upon the manner of co-operation of the bits and body portion, or their principle of action, in expansion or contraction, if the thrust-bearings for the cutters just above the spreading-bearings were widened still further toward the periphery, or clear to the periphery, or the tool?

Mr. BLAKESLEE.—Objected to as leading, and and as assuming that an underreamer organized in accordance with the hypothesis of this question would be capable of displaying by operation any mode of operation or interrelation of parts whatsoever, the testimony having not shown that any trial was ever made or attempted of any underreamer organized as presupposed in the question; and as purely speculative.

A. It would absolutely have no effect on the expansion or contraction of the reamer.

Q. 338. (By Mr. LYON.) What change, if any, from the original mode of operation of principle of co-operation of the bits upon the body in expansion and contraction, has the machining out of the metal from this body had?

Mr. BLAKESLEE.—Same objections; and the further objection is made that the witness has at

(Testimony of Thomas J. Griffin.)

no time qualified to answer any such purely hypothetical question.

A. None whatever.

Q. 339. (By Mr. LYON.) And how does the present mode of operation, as embodied in this exhibit, and using therein the same construction and form and size of bits originally utilized therewith, compare with such mode of operation and co-operation of the bits and body in expansion and contraction as originally made?

Mr. BLAKESLEE.—Same objections as noted in the last two instances. [473]

A. They are identically the same.

Q. 340. (By Mr. LYON.) Do you know the circumstances under which this machining out of this body was performed? A. I do.

Q. 341. State. A. Myself.

Q. 342. For what purpose?

A. For the purpose of demonstrating that Mr. W. W. Wilson's answers—I can't recall the exact question or answer, or the number of page of the question and answer—were erroneous, when he testified that if the central portion of the Double reamer was removed there would be no expansion or contraction, and that the bits or cutters would swing idly and would not operate.

Q. 343. And what are the facts in such regard, Mr. Griffin?

A. Why, unquestionably they will operate, and pretty successfully.

Mr. BLAKESLEE.—Objected to as not respon-

(Testimony of Thomas J. Griffin.)

sive. The question called for the fact. The answer did not purport to give the facts, but merely opinion.

Q. 344. (By Mr. LYON.) These facts have been demonstrated by you in what manner?

A. By placing the cutters therein and expanding them and contracting them; and their expansion and contraction are identically the same since this milling was done, or the removing of the central portion of the slotted extension, as it was before.

Q. 345. What other changes, if any, have been made in this body, other than simply milling out a quantity of the central metal and the insertion of this bolt at the bottom?

A. None. There has been no other work done on the body.

Q. 346. Then, otherwise than as described by you heretofore, the body remains in the same shape as originally made as a part [474] of Underreamer No. 163 by the Union Tool Works in 1903, is it?

A. Yes, sir.

Mr. LYON.—The body produced by the witness is offered in evidence and marked “Complainants’ Exhibit Double Underreamer With Enlarged Slot.”

Mr. BLAKESLEE.—It is believed that this designation of this exhibit is not as full and not as accurate as if it were as follows: “Complainants’ Exhibit Double Underreamer With Hollow Slotted Extension Partially Removed and Bolt Added at Bottom.”

Q. 347. (By Mr. LYON.) Mr. Griffin, has the

(Testimony of Thomas J. Griffin.)

hollow slotted extension in this exhibit been removed? A. No, sir; it has been enlarged.

Q. 348. You mean the slot has been enlarged?

A. Yes, sir.

The body produced by the witness is offered in evidence and marked "Complainant's Exhibit Double Underreamer With Enlarged Slot." The hollow slotted extension of this reamer has not been removed. The slot has been enlarged.

Q. 349. Will you compare this last exhibit with the similar portion of "Complainants' Exhibit Wilson Underreamer No. 2" and point out the similarities or difference, if any, which are material.

Mr. BLAKESLEE.—Further reference to this exhibit during the course of rebuttal proofs in this case, with any assumption that it shows anything operative, is objected to on the ground that no proofs have been adduced to prove any such operativeness, no testimony having been adduced as to the use of this exhibit in any actual practice or in any manner amounting to a working test thereof; and the use of this exhibit as evidence—that is, the exhibit last introduced—is objected to as to anything further than a mere hypothetical structure or an arbitrary modification, [475] the utility of which has in no manner been proved.

A. They are substantially the same. The "Complainants' Exhibit Wilson Underreamer" has a key about one and a half inches above the shank thrust-bearing, which the Double exhibit has not. One other slight difference is that the portion above the

(Testimony of Thomas J. Griffin.)

spreading-bearing of the Double has not been machined off similarly to that of the "Defendant's Exhibit Wilson Underreamer No. 2." Otherwise they are substantially the same.

Q. 350. (By Mr. LYON.) What difference in the mode of operation or principle of coaction or co-operation of the bits and body portion of the underreamer in expansion and contraction does the cutting off of the portion last referred to by you make?

A. None. They are substantially the same.

Q. 351. What have you to say as to the operative-ness of this last exhibit as an underreamer?

A. That underreamer will operate and do good service.

Mr. BLAKESLEE.—It is asked that this answer be stricken out as merely reflecting an opinion; not the best evidence; no foundation laid for secondary evidence.

Q. 352. (By Mr. LYON.) Referring to the testimony of William W. Wilson, in answer to Q. 15 he says: "In the Double underreamer the expansion of the cutters is caused by contact of suitable faces on the cutters with the main body of a wall or projection of the extension shown at 6. In order to allow the cutters to collapse over this extension, pockets are cut in the backs of the cutters, these notches being on the shank or upper extension of the cutter. No such means are necessary in the Wilson reamer." Do you agree with Mr. Wilson in this testimony? If not, state any reasons for disagreeing.

(Testimony of Thomas J. Griffin.)

A. Now, the question, Mr. Examiner, and the quotation.

The SPECIAL EXAMINER.—“Referring to the testimony of [476] William W. Wilson, in answer to Q. 15 he says: ‘In the Double under-reamer the expansion of the cutters is caused by contact of suitable faces on the cutters with the main body of a wall or projection of the extension shown at 6. In order to allow the cutters to collapse over this extension, pockets are cut in the backs of the cutters, these notches being on the shank or upper extension of the cutter. No such means are necessary in the Wilson reamer.’” A. Yes, sir.

The SPECIAL EXAMINER.—“Do you agree with Mr. Wilson in this testimony? If not, state any reason for disagreeing.”

A. I agree with Mr. Wilson. That is the case, as shown.

Q. 353. Do you agree with Mr. Wilson that “no such means are necessary in the Wilson under-reamer?” A. I do not.

Q. 354. What similar or substantially the same means are necessary or utilized in the Wilson reamer?

Mr. BLAKESLEE.—Objected to as leading.

A. I wish to here correct myself in the previous answer, as I was misled in the question or I misunderstood the question and the quotation.

Q. 355. (By Mr. LYON.) Make your correction. (To the Special Examiner.) Just read the question, with the quotation, and his answer, and any-

(Testimony of Thomas J. Griffin.)

thing else on the record he wants, and then let him make his correction.

The SPECIAL EXAMINER.—“Referring to the testimony of William W. Wilson in answer to Q. 15 he says: ‘In the Double underreamer the expansion of the cutters is caused by contact of suitable faces on the cutters with the main body of a wall or projection of the extension shown at 6. In order to allow the [477] cutters to collapse over this extension, pockets are cut in the backs of the cutters, these notches being on the shank or upper extension of the cutter. No such means are necessary in the Wilson reamer.’ A. Yes, sir. The Special Examiner: ‘Do you agree with Mr. Wilson in this testimony? If not, state any reasons for disagreeing.’ A. I agree with Mr. Wilson. That is the case, as shown.”

A. I wish to say that the expansion and contraction of the cutters of the Double and Wilson reamer are substantially the same, and I disagree with Mr. W. W. Wilson, as the inner faces of the Double cutters are utilized for the expansion and contraction over the spreading-bearing on the lower end of the Double reamer, and also the inner faces of the Wilson cutters are utilized and spread over the spreading-bearing on the lower portion of the hollow slotted extension of the Double and the hollow slotted extension of the Wilson substantially the same.

Mr. LYON.—Now, read him the last question which he has not answered.

(Testimony of Thomas J. Griffin.)

The SPECIAL EXAMINER.—“Q. 354. What similar or substantially the same means are necessary or utilized in the Wilson reamer?”

Mr. BLAKESLEE.—That is the question to which I objected.

The SPECIAL EXAMINER.—Yes.

A. They are substantially the same, and the same means.

Q. 356. (By Mr. LYON.) Will you point them out to us?

A. This is the lower portion of the hollow slotted extension of the Double reamer over which the cutters expand and contract, and this is the lower portion of the slotted extension of “Complainants’ Exhibit Wilson Underreamer No. 2” over which the cutters expand and contract. [478]

Mr. BLAKESLEE.—Pointing to the lower ends of the prongs or body of the exhibit.

Q. 357. (By Mr. LYON.) Now, show us what are the inner surfaces of the bits of “Complainants’ Exhibit Wilson Underreamer No. 2” which coact with the part just referred to by you.

A. This is the part of the cutter that I have referred to that coacts with the lower portion of the slotted extension of “Complainants’ Exhibit Wilson Underreamer No. 2.”

Q. 358. (By Mr. BLAKESLEE.) Now, point to them, will you?

A. I have got my fingers on them.

Mr. LYON.—Witness puts his fingers upon the two shoulders at the sides of the shanks of the bits,

(Testimony of Thomas J. Griffin.)

and on the inner surfaces just below such shoulders.

Q. 359. In expanded position what is between the cutters or bits, respectively, in the Double underreamer and the Wilson underreamer?

A. The lower portion of the slotted extension of the bodies.

Q. 360. Is that a fixed piece and one part of the body integral therewith, or a movable part?

A. That is a fixed part of the body.

Q. 361. In both the Double and the Wilson?

A. In both the Double and the Wilson.

Q. 362. And for what purpose is such part in both the Double and the Wilson?

A. To hold the cutters in expanded position and to allow the cutters to contract over the same solid portion of the body.

Q. 363. If the dovetails on the shanks of the Wilson bits or the dovetails at the sides of the slot in the body of the Wilson underreamer were removed, what would there be to guide the upper ends of the cutters into position?

Mr. BLAKESLEE.—Objected to as merely a hypothetical question, [479] calling for a conclusion upon the part of the witness, and for his mere naked opinion, and as leading, and particularly in assuming the presence of any slot, as such, in the Wilson reamer body; and irrelevant, immaterial and incompetent for any purposes of rebuttal proof.

A. The upper ends of the cutters would simply fall out and would be inoperative; that is to say, the cutters would expand and contract but they would not stand any service.

(Testimony of Thomas J. Griffin.)

Q. 364. (By Mr. LYON.) Mr. W. W. Wilson, in his testimony, in his answer to Question 15, says: "In the Double underreamer the cutters are expanded to working position, first, by spreading—means introduced between the backs of the cutters, and, second, by the upper ends of the cutters traveling upward on the inclined dovetailed ways, drawing the upper ends of the cutters closer together;" and, also, "In both the Wilson exhibits the cutters are expanded solely by having expanding-means thrust in between the outer edges of the cutter." Do you agree with Mr. Wilson in this testimony; and, if not, state wherein you differ.

A. I do not agree with Mr. Wilson in his statement, as the dovetails of the Double reamer have nothing to do whatever with the contraction or expansion of the Double cutters. They are there merely for the purpose of preventing the cutter from coming out or falling off the key and for the purpose of preventing the sidewise movement or the outward movement from the central portion of the body, and do not pertain to the expansion or contraction of the cutter and have no relation to it.

Q. 365. And how do the dovetails and their inter-relation to the spreading-bearing and thrust-bearings and the cutters in the Wilson underreamer, both as exemplified in "Complainants' Exhibit Wilson Underreamer" and "Complainants' Exhibit Wilson [480] Underreamer No. 2," compare with this expansion and contraction of the Double?

A. They are substantially the same.

(Testimony of Thomas J. Griffin.)

I do not agree with Mr. Wilson in regard to the sub or joint. I do not consider that the extra joint increases any of the hazards. The joint in the sub is very much larger and much stronger than any joint in a string of tools.

Q. 372. What have you found, in your experience, to be the comparison between the Double and the Wilson underreamers in regard to the facility for adjusting the tension on the spring-actuated mandrel or rod and the removal and replacement of the bits or cutters?

A. It is very much easier to remove and replace the cutters of the Double reamer than the Wilson, as, ordinarily, it will not take more than five minutes, at the outside, to put on a set of new cutters, or sharp cutters, on the Double reamer, and the adjustment of the spring-actuated mandrel or rod, when once set up properly, does not have to be touched or changed. Owing to the fact that you screw an eye-bolt in the bottom of the mandrel and fasten that to the derrick floor or place thereon a suitable amount of weight and tramp up your tools until this action brings a strain, or expands the spring sufficiently to take the tension off of the key that goes through the cutters and spring-actuated mandrel, pulling out one of the small cotter-pins that go through the outer portion of the bit directly across the lower portion of the slot in the shank of the bit, push the key out at this juncture, remove your cutters by pulling them down out of the dovetails, shoving up into the dovetails the new set of

(Testimony of Thomas J. Griffin.)

cutters, pushing in the key through one of the cutters, thence through the mandrel and into the other cutter, and placing the cotter-pin, or driving it in, and then your cutters or reamer [481] is ready to be run back into the hole. With the Wilson Complainants' Exhibit 4½" Reamer it was quite a proposition to put on a new set of cutters, often having to take this body to the shop and placing it under the drill-press and drilling out the dowel-pins that hold the retaining-block that is located just at the upper ends of the hollow slotted extension, and also to drill out or saw in two the retaining-bolt, or drill it out, at the lower end of the slotted extension. After that was removed, the dowel-pins and retaining-bolt, then you could pull the spring-actuated T-rod down and remove the old cutters, replace the new, and shove back into the slotted extension, screw in new dowel-pins if the others had to have been drilled out, otherwise the old, and shoving up into position, holding one side up with a pin while you screwed one of the dowel-pins on the opposite side into position, thence the opposite one where the pin was in, and then putting in your retaining bolt or safety-bolt at the lower ends, thence putting in your cotter-pins or Keys to prevent the dowel-pins and the retaining-bolt from unscrewing, necessitating a great deal of time and trouble. In "Complainants' Exhibit Wilson Underreamer No. 2" they have replaced the old T-rod by a differently constructed T, being much larger, with an elongated slot therein, and have also added a slot through the hollow

(Testimony of Thomas J. Griffin.)

portion near the thrust-bearings of the shanks about one and a half inches above the same, and placed therein a key that has shoulders on each side or just sufficiently wide to allow the said shoulders of the key to drop inside of the bore of the mandrel, thereby preventing the key from being lost, owing to the fact of it being driven in and under and through the slot in the body and the spring-actuated T-rod, or, if necessary, to take out, by the use of a small chisel or other instrument, driven under one corner on [482] the lower side of the key, raising the key up by placing a strain or contracting movement on the spring, and thence be driven out by a small punch or a key. That releases the spring-actuated T-rod. All, then, that is necessary to do is to unscrew, if possible, the retaining-bolt at the lower ends of the spreading-bearings—making it a simpler and quicker operative device than their old. But still, with this improvement, I do not think that you can remove the cutters and replace the cutters on this exhibit as quickly as you can on the Double.

Q. 373. Mr. W. W. Wilson, in his testimony, says that the bottom bolt is a feature of the Wilson reamer which does not exist in the Double reamer. Do you agree with him in this? A. Yes, sir.

Q. 374. He says that this bolt comes into use only when excessive wear or breakage of other means provided for limiting the cutters takes place. Do you agree with him in this statement?

A. I do not.

Q. 375. Please explain.

(Testimony of Thomas J. Griffin.)

A. This retaining-bolt at the bottom of the Wilson reamer is an absolutely essential feature, as it is at all times under a tension, serving the purpose, first, in the event of the T-rod breaking, that—at the upper end, I speak now of “Complainants’ Exhibit Wilson Underreamer No. 2.” If that rod was to break at or near the upper portion of the elongated slot, that this retaining-bolt would then prevent the cutters from falling into the well, if the reamer at that period was being pulled out of the casing. But, if it was broke, and continued to attempt to operate the reamer, it would burr up the upper portion and would probably bend and the cutters would be lost in the hole. That is one of the features of the retaining-bolt. If the retaining-bolt was not there, a boulder or any hard substance coming in [483] contact with the lower portion of the slotted extension would have a tendency to spread and throw an immense strain outwardly, and if it were not for the retaining-bolt it probably would drive itself up between the cutters, stripping the dovetails from the body and losing the cutters and T-bar with the string of tools in the hole. Also, it acts as a safety when the reamer comes in contact with the drilling of a crooked hole or striking on a partially reamed circle at or near one corner of the cutter, which is often the case, throwing a tremendous strain sidewise, giving the tools a rotary motion. If this pin was not in there the slotted extension portions would spread. In “Complainants’ Exhibit Wilson Reamer No. 2” I find that this

(Testimony of Thomas J. Griffin.)

reamer is sprung, I having personally taken this reamer off of a string of tools that was being operated at the time I went to the well, and I find by placing the calipers thereon, though it had the retaining-bolt therein, that it is sprung.

In regard to Mr. Kibele testimony that he ordered his Wilson reamers made without safety bolts, I will say I recently visited Mr. Kibele in Bakersfield and on examining his reamers at the Bakersfield Iron Works noticed that all of them—three—had the retaining bolt in position.

Q. 381. (By Mr. LYON.) You have now referred to so much of the tilting action as is embodied in the initial contraction of the Double. Have you completely stated your exceptions to Mr. Wilson's testimony in regard to there being no tilting action in the Wilson reamer similar to the tilting action of the cutters on the key or T of the spring-actuated rod of the Double?

A. I have not.

Q. 382. Please compare such action, and state wherein you disagree with Mr. Wilson.

A. I disagree with Mr. Wilson, from the mere fact that the [484] tilting action of the cutters on the T-rod of the Wilson and the spring-actuated rod and key of the Double are substantially the same.

Q. 383. What difference is there in that?

A. None.

My opinion is the Canadian underreamer was a makeshift.

A. 385. The Canadian underreamer—so-called

(Testimony of Thomas J. Griffin.)

underreamer—is not even, in my estimation, a make-shift. First, that it is too weak. In days gone by, when they underreamed, or attempted to underream or use this tool with pole-tools—to be plainer, instead of the rope cable or wire lines, such as now are used, it was intended to be used with a string of poles—in the day and time when they used the shin skin casing and practically no shoe—a very light, thin and short, flimsy shoe, and in soft clayey formation—this underreamer might have been used to scrape off the sides of the walls and allow this shin skin casing and shoe to follow, as the casing in those days could not even be dropped, or “spudded,” as now called, as the weight would telescope itself, and the tool as constructed now would not stand on a string of tools for the second lick: First, because the cutters passing through the body are retained by a small bolt coming against shearing-shoulders on the shanks of the cutters, and if this bolt did not shear off, causing the loss of the lugs in the hole, they are so flimsy and thin and long that the first lick that would be struck on any solid formation they would be bent and doubled up or broken off in the shanks and lost in the hole. This tool I don’t consider a safe tool to run into anything with a cable and line. And, further, it has not the expansion, nor can it be made, in the present form, to have sufficient expansion, to ream a hole large [485] enough to allow the shoe and casing such as used and has been used in this field, or the oil fields, for many years, and would be considered by me as a dangerous piece of

(Testimony of Thomas J. Griffin.)

junk to run into a hole.

I have seen cut in catalogue Oil Well Supply Company, figure 2161, many times during the last 13 years, in the Oil Well Supply Company's catalogues, and have often wondered how such a reamer would be or could be operative, and have many times with other people tried to figure out how the cutters were fastened together at their lower portion, or directly across the spreading-portion of the mandrel, and surmised what kind of a contrivance could be placed in there to withstand the outward strain that I know is on a cutter, and I have wondered what kind of a dovetail it might be interposed between the cutters at their spreading-surfaces to prevent them from twisting around the mandrel or main portion of the body. In looking at Figure 2161 Underreamer Canadian pole tool system, and carefully scrutinizing the cutters, apparently this cut must have been made from a drawing, as the cut shown shows a very much thicker portion or shank. It also shows that the white line interposed between the mandrel and the body comes very near up to the top. It even shows that this white line comes to the center portion of what I now know as the retaining-pin, thereby misleading and not showing any portion of the upper ends of the shanks going in and interlocking as they now do. I have often been in the storerooms of the Oil Well Supply Co. at various places. I never saw or heard of one of these Canadian reamers in any of such stores. I never saw one, but I asked their general manager, one day, Mr. Carmody, who was

(Testimony of Thomas J. Griffin.)

located at the time at Corsicana, Texas, in 1900 or 1901, if he knew anything about this Austrian or Australian or Canadian underreamer; that I [486] would like to see one, as I was going to drill a well for Shanghai Pierce, down in the southwestern portion of Texas, and thought that I would have to have a reamer, and I wanted to select something that was good. He says, "Griffin, I have been with the Oil Well Supply Company for many years, having been sent out here from the Pittsburg house, and I never saw one of those reamers, and I don't think that we have any or could even get one for you. I think it is a drawing or cut that they carry in the catalogue for the purpose of filling up."

Mr. BLAKESLEE.—It is asked that all that portion of the last answer which purports to be something that Mr. Carmody stated to the witness be stricken out and withheld from consideration, as not a statement made in the presence of any of the parties to this suit, not the best evidence, and no foundation laid for secondary evidence, and that manifestly the best evidence would be gained by producing the party, Carmody, or somebody capable of testifying to the same matters.

I do not agree with Mr. W. W. Wilson that there is no slot or slotted extension in the bottom of the Wilson underreamer.

This is a slot in the Wilson underreamer extending from this point clear out to the lower portion, namely, that opening between the prongs or the reamer.

(Testimony of Thomas J. Griffin.)

With the Double Reamer Complainants' Exhibit or Defendants' Exhibit the cutters when collapsed bear against the lower portion of the spreading-bearing.

When the cutters of the Wilson underreamer are collapsed they bear identically the same as the Double, their lower spreading-bearings, the shoulders of the cutters on their inner faces bear against the lower end of the body or spreading-bearings.

Direct Examination in Rebuttal Resumed. [487]

Q. 403. Will you please compare the action in collapsing of the Double and Wilson underreamer bits in the Double underreamer and Wilson underreamer of the exhibits last referred to? And I refer particularly, in this question, to such collapsion as exists when the underreamer is drawn back into the well-casing at the bottom of the well.

A. In both the Double and Wilson exhibits, also the alleged old style type of Double and the old type of the Wilson underreamers, their action when coming up out of the hole at the bottom of the casing-shoe is that the casing-shoe strikes on the Double at the outward shoulder, which is located just above the small holes of the sides of the cutter and is used for the purpose of retaining a cotter-pin. Comparing this described shoulder with the Wilson, I find that the shoulders correspondingly are in the same relative position. When this action takes place, the cutters or bits stop. The tools or body-portion of the reamer continue to move upward until the inner faces of the lower portion of the lugs pass the outer-

(Testimony of Thomas J. Griffin.)

most corner of the wedge-shaped spreading-bearing, and at this point they collapse almost instantly over the wedge-shaped lower spreading-bearing, allowing the cutters at this point to start on their upward movement with the body of the reamer, being in contact at this time with the outer surface of the bit with the inner sides of the casing. And I speak of the normal contraction of the cutters only, in this comparison. And the two different types of reamers, both Double and Wilson, contract in identically the same manner.

Q. 404. You have identified the particular shoulder referred to by you in the Double underreamer bits, and I will now ask you to point out the shoulder which you refer to on the Wilson bit, [487½] the one that the casing contacts with.

A. This is the shoulder that I have reference to that comes in contact with the inner rounded surface of the casing-shoe. This shoulder that I speak of is located on the outer surface of the cutter, about one and three-quarters or two inches below the thrust-bearing of the shank.

Q. 405. And how, in point of location with respect to the pivot-point upon which the cutters tilt on the spring-actuated rod, do these shoulders, respectively, in the Wilson and Double bits compare?

A. They are as near the same as they could possibly be put. The reason for bringing the contact of the casing-shoe close to the pivot or tilting-point of the cutters is to permit the cutters to tilt on the spring-actuated rod. If the contact is below that

(Testimony of Thomas J. Griffin.)

point the action would be sliding, or if it was above this point it would be binding.

Q. 410. You have referred to this answer of yours in regard to the normal contraction of the cutters only. In case the underreamer was in expanded condition below the well-casing and pinching should take place, what action is brought into play, if any?

A. At that point it has an entirely different action. When the reamer is expanded and is in working position and is bound in a hard formation, the cutting edge of the cutter having been dubbed off, as the cutter starts down the slotted extension, owing to the mandrel portion being pulled upward on the upstroke of the tools, the outward edges of the cutters binding holds the cutters in position, or stopped, until the mandrel rises sufficiently to clear the thrust-bearing of the cutters. As soon as this takes place, the outward binding tendency against the wall of the hole [488] is relieved, owing to the fact of the upward and inwardly inclined dovetails allowing the cutter to tilt slightly over the lower portion of the spreading-bearing, thus causing a very slight sliding movement of the cutter shank on the key. This description describes the action of the Double cutters. In regard to the Wilson, when the reamer is in position, reaming, and becomes pinched or bound in this same formation as the Double, the outer or cutting surfaces of the reamer lugs being pinched, remain in stationary position until the upstroke of the tools raises the mandrel or body sufficiently to allow the cutter to slide downwardly over the slightly

(Testimony of Thomas J. Griffin.)

tapered bearings sufficiently to allow this binding tendency to become released; then the spring-actuated rod, acting in the same manner with the Double as the Wilson, pulls the cutters back up into position against their thrust-bearings; and the tendency to relieve the cutters, one with the other, is identical, from the mere fact that the slightly tapered cut-away portions of the Wilson body allow the gradual contraction and expansion, which is substantially the same for all purposes and answers for the same purposes as the upward and inwardly inclined dovetails of the Double.

Q. 411. The action which you have referred to in your last answer is what you have heretofore referred to as the initial collapsion of the bits in the Double and Wilson reamers? A. Yes, sir.

Q. 412. And, if I understand your testimony correctly, this feature is for the purpose of taking up any possibility of thus having the bits pinched in the well? Is that correct? A. Yes, sir.

Prior to my experience as a driller of oil wells I served my apprenticeship and time as a machinist with the Ames Iron Works, in Oswego, New York; with them four years. Was then foreman of the [489] Lee's Iron Works, Galveston, Texas, for nearly two years. Then with the Santa Fe Railroad shops at Galveston. The head machinist of the Galveston Cotton & Woolen Mills.

After hearing the testimony of Albert Shinneller I found upon inspection that the Murphy Oil Company of Whittier are using nothing but Double un-

(Testimony of Thomas J. Griffin.)

derreamers. This was a few days after Mr. Shinneller testified. I also found Double reamers on the property of the Central Oil Company of Whittier. Also Double reamers are being used in the Salt Lake fields exclusively. I did not find any Wilson reamer in use there.

A. 433. I knew this as a fact when I was there with the Niles Lease Company; and just before the beginning of the taking of testimony in this case I was requested by Mr. Lyon to secure a Wilson underreamer to exhibit, and I told him I could get one close to town, and a small one, as the Salt Lake Oil Company had a full string—I thought four or five—reamers laying on their tool-rack, and that I could go out and get one for him, as they were not using them, to my personal knowledge, having discarded them and thrown them into the scrap-list.

In regard to the North Underreamer, patent #674,793.

Q. 439. What have you to say in regard to such a construction of an underreamer or tool?

A. First, I would say that such a constructed tool is inoperative and would be a dangerous tool to run in a hole.

Q. 440. Give your reasons.

A. First, because there is no partition between the cutters to prevent them from collapsing and expanding with the least particle of friction on the lugs. Such partition is necessary to take the inner thrust of the cutters.

Nothing to keep them from "jack-knifing," in

(Testimony of Thomas J. Griffin.)

other words. There is nothing in the North underreamer construction to resist that jack-knifing.
[490]

A. 442. They work on a hinge similar, I mean, to a knife-blade and the handle. As, for instance, taking a knife by the end of the blade and the end of the handle, it closes very easily, owing to the fact that it has a rounded bearing, throwing a very small amount of the spring-tension on the back, allowing the knife to open and shut very easily. I further find, as shown in Fig. 1 of the North underreamer patent, a feature which is clearly inoperative. For instance, as clearly shown here, the T-rod, f, comes down below the lower portion of the bowl, allowing the cutters and T-rod to turn around, circularly, thus throwing this T-rod out of the slot that is made in the bottom of the bowl to receive said T. Therefore the cutters could not expand or contract. From the drawing, I should say that this T-rod comes down from one-half an inch to an inch and a half below said bottom of the bowl, which is the thrust-bearing which imparts to the cutters, 6, its thrust-bearing. I also find that this tool would be inoperative owing to the locking-mechanism being very weak, flimsy, and not designed so that it could possibly be operative. I do not find any comparison whatever in the mechanical construction of this tool and the Double, with the exception of two features, one of which is the pin located on the upper portion of the sub, and the other is the spring, G, normally holding the T-rod in position.

(Testimony of Thomas J. Griffin.)

A tool constructed along the lines of the Day under-reamer is clearly an inoperative device. I do not consider such a tool safe to be run inside of a casing, even just to run it in and pull it out without doing any reaming. First, owing to the fact that the cutters, when in contracted position, are parallel, and when such a tool as this would be run in the hole and the outer surfaces of the cutters would be working and in contact with the inner walls of the casing throughout their entire length, the [491] point or cutting edge also would be in contact, and if you would run this tool in the hole and it came to a joint in the casing where the pipe was not made up shoulder to shoulder, these cutting edges would instantly go into the casing and injure your casing. If you did get such tool in the hole and attempted to ream on any hard shell with the standard stem and jars as we use in a well for drilling purposes, the first lick that would be struck, probably, would push the reins of the cutters and throw them out of line, there being no dovetails or retaining-means on either the dart-shaped portion or the thrust-bearings thereof of the lower portion of the cutter, nor no dovetail or retaining-means at their upper thrust-bearings, which is constructed in a V-shaped notch against a removable portion of the tool by means of keys or dowel-pins engaging the rounded portion of the stem with this enlarged part of the body, making that part of the reamer very weak. And, again, if the tool was operated for a short time in the hole, it would naturally become filled with mud or drill-

(Testimony of Thomas J. Griffin.)

ing, which is at all times of a sticky formation; it would wedge up between this block portion and the cross-head in and around the spring, thereby not allowing it to collapse, and it would also fill the rounded portions of the lugs which causes the cutter to expand and contract over this V-shaped portion, thus binding this tool, and when it come in contact with the casing-shoe and the dart attempted to get into this rounded portion located on the inner faces of the cutters, it would proceed to pull the dart up higher, thus expanding the cutters, and at that time you could not possibly get this reamer back in the bottom of the casing. In the course of drilling the tendency, as I have previously explained, and which has been demonstrated—for instance, ripping the dovetails from the bodies of the Double reamer and the Wilson reamer, this same [492] action would force these lugs outward and would bend their reins up and twist them possibly beyond description. Therefore I should say that such a tool as is disclosed in the Day patent would not even be a makeshift, and I would not consider such a tool as one that could be taken on a lease and attempted to be used, with any degree of safety.

To make the reins of the Day reamer heavy enough would make them too stiff to spring and they would not collapse. It would bind the cutters in against the dart to such an extent that I don't think you could pull the reamer out of the casing.

The underreamer disclosed in the O'Donnell & Willard Patent #762,345, is neither mechanical nor practical.

(Testimony of Thomas J. Griffin.)

A. 456. As to its practicability, based upon my experience with underreamers, first, I find that there is no thrust-bearings on the shanks of the O'Donnell & Willard underreamer. Further, that such a device as disclosed is inoperative, from the mere fact that the collapsing pressure that is brought to bear upon the cutters is away down below the fulcrum of the cutters, making the cutters expand and contract in such a way that they are not practical, there being no slotted extension for the shanks of the cutters to tilt in and out, causing a binding pressure upon the cutters transferred into the division or central screwed-in portion, creating a great deal of friction. Neither is there any dovetails or guides guiding the cutters. And, again, that it throws the thrust-bearing upon the circular circumference of the body and upon the shoulders of the cutters, giving an action there that is binding, not allowing the cutters to swing in freely and ride over their outer faces, necessitating some device by which they could be locked down while going into the casing and below. No such locking device on an underreamer, to my personal knowledge, has ever been tried and [493] found either safe or satisfactory in an underreamer, from the reason that when an underreamer is lowered below the casing-shoe it is necessary in all instances to find the bottom of said shoe. With a tripping mechanism or projection that sticks out through the side of the body, the driller would not be able to tell whether it was the retaining mechanism in the

(Testimony of Thomas J. Griffin.)

body or locking device that come in contact with his shoe or whether it was his lugs. Therefore he would not know where or how to hitch over his tools, and if he hitched them up too high, having been deceived in finding the bottom of his shoe with his cutters, after a few strokes of the beam his locking device would be broken off or so badly disfigured it would render the tool and device absolutely impracticable. And, again, in the O'Donnell & Willard underreamer, I find the lugs, for all practical purposes, to be so large that they fill the circle of the hole, rendering them impractical, for the reason that any small parts of rock or drillings that could possibly work up above the lugs of the reamer would get in behind those lugs, wedge them against the wall, and not allow the reamer to be moved upward and downward. Next, that in drilling in any sticky substance, such as shale, hard clay, the tools would ball up after a very few strokes, forming a piston in the hole, and would wedge the reamer in such a shape that it would not work either up or down, as, at the sides of the lugs, in the Double reamer and the Wison reamer, there is no water course, or room for the drillings to work up by the tool. Often, when pulling out, and in the majority of instances a reamer or bit is pulled out from the hole, it is necessary to take a pick or axe and cut the hard, dry formation from the tools, and if this tool was in that kind of formation it wouldn't work five minutes. As disclosed in the patent drawings, the locking device would clearly be inoperative,

(Testimony of Thomas J. Griffin.)

not [494] only non-mechanical, but such a structure as disclosed in the drawings, I do not believe it would operate even if it was above the ground; and when that reason is so, Mr. Willard saw fit to improve on his original reamer by placing a collar and an interrelated key with lugs projecting through the sides of the collar, for the purpose of pulling the spring downward and allowing the cutters to hang inside of the casing without any tension or friction on the sides of the cutters conveyed to the walls of the casing. Such a feature as he has constructed on exhibit unquestionably is a failure, such that I would not attempt under any circumstances to run into a hole.

Mr. BLAKESLEE.—It is asked that that portion of the witness' answer relating to what Mr. Willard did be stricken out and withheld from consideration, as not responsive to the question, and particularly in view of the allegation by the witness as to the reasons moving Mr. Willard to the addition of such improved features to the exhibit "O'Donnell & Willard Underreamer"; and the continuing objection is made that the witness is testifying apparently speculatively, and merely by a statement or upon opinion, and it is submitted that such evidence of testimony is not the best evidence, the record being replete with evidence as to the facts concerning this O'Donnell & Willard underreamer, and the actual use and operation of the exhibit, "O'Donnell & Willard Underreamer."

Q. 457. (Mr. LYON.) You have referred to the watercourses in the Double & Wilson underream-

(Testimony of Thomas J. Griffin.)

ers. To what do you refer in this connection, Mr. Griffin?

A. I refer especially that it is necessary in the operation of any tools in a well to have ample room between the body of the tool and the hole drilled, for the drillings to pass freely up by the body, or between the body and the walls of the hole; and only described that as a watercourse, for the reason that [495] we use the word "watercourses" in connection with our drilling-bits.

Q. 460. You have testified that in "Defendant's Exhibit O'Donnell & Willard Underreamer," as well as in the proposed construction illustrated in the drawings and described in the specifications of "Defendant's Exhibit O'Donnell & Willard U. S. Patent Number 762,435," there are no thrust-bearings on the shanks of the cutters. On what portion of the shanks of the cutters do you mean.

A. The upper portion.

Q. 461. Or upper ends?

A. Upper ends; yes, sir.

Q. 462. Where, in these exhibits last referred to, are the vertical thrust-bearings?

A. They are on the body, the lower portions of the body, of the reamer mandrel, or at the beginning of the bowl.

Q. 463. And what portion of the bits contact with the body there against?

A. The shoulder, which is located just above the ends or cutting-edges.

(Testimony of Thomas J. Griffin.)

Q. 464. And this shoulder is disposed at all times outside the body portion or bowl of the underreamer?

A. Yes sir. That is what I had reference to when I said that any drillings that was not mixed up would get probably a little bit worked up above, and get in behind the shoulders and bind the lugs or bits.

Q. 465. From a mechanical standpoint, with such a construction as exemplified in either "Defendant's Exhibit O'Donnell & Willard Underreamer," or in "Defendant's Exhibit O'Donnell & Willard U. S. Patent Number 762,435," how would it be possible to bring the point of contact on the casing at or to the necessary relation [496] with the pivot or fulcrum point of the bits on the spring-actuated rod to secure the proper collapse and expansion of the bits? A. It would be utterly impossible.

Q. 466. What feature of construction is it in the Double and Wilson underreamers which permits such relation to be gained?

A. The slotted extension.

Q. 467. And the projection of the backs of the shanks of the cutters through the slot of such extension? A. Yes, sir.

Q. 470. For what reason?

A. For the reason that the cutters are encased inside of a bowl; the backs of the cutters not coming in contact with the casing at or near their fulcrum points; there being no fixed partition between the cutters, and this being a locking device, necessitating the holding down of the cutters until past below the casing, which has previously been dropped into the

(Testimony of Thomas J. Griffin.)

well; a block of wood to drive the wedge up between the cutters, spreading them out into an expanded position, forming a positive lock; and such a tool would necessarily piston itself—could not relieve itself at any time, when being pinched in that shell, but would bind and hang, springing the tools, until, when they did come loose, they would have a tremendous spring or jerk, bounding upwardly in the hole, and the probabilities are catching the tools on their upward stroke, giving a tremendous strain on the line or cable, and probably parting the cable and losing the tools in the hole. This reamer compares to the O'Donnell & Willard, having its thrust-bearing in the same relative position; no slotted extensions for the bits passing through the sides of the body to ride in and out of the casing at or near their fulcrum.

Q. 471. You said that there is no partition or portion fixed to the body, and immovable with respect to the body, lying between [497] the bits, when in expanded position, in this Kellerman reamer. In this respect, to what other exhibit introduced on behalf of the defendant does this correspond?

A. To the North. And I wish to correct a portion of this last answer, by saying when I referred to the O'Donnell & Willard I intended to say to the North.

Q. 472. You have referred to the action of the North cutters or bits, and their liability to "jack-knife." With respect to such action, what have you to say with regard to this Kellerman exhibit?

A. Its action would be practically the same, for

(Testimony of Thomas J. Griffin.)

the reason that if the locking device—which I seriously doubt—were ever a success, the spreading-wedge would be below the cutters, and would give them identically the same “jack-knifing” effect as the North.

Q. 473. What have you to say as to the comparative principle of coaction or cooperation of bits and body portion, in expanding and contraction, in this Kellerman Exhibit, as compared with such action in the Double and Wilson underreamers?

A. There is no comparison between them. It has no relative principles of either reamer embodied.

Q. 474. In other words, then the Kellerman is totally different in this respect? A. Yes, sir.

A. 477. Is this “Defendant’s Exhibit, Sample of Swan Reamer,” substantially the Leidecker or Swan reamer to which you referred in your former deposition on behalf of complainants? A. Yes, sir.

Q. 478. In what manner, if at all, does the principle of action or co-operation of the bits and body of this exhibit compare with the principles of action or co-operation of the bit [498] and body portion of the Double or Willard underreamers, in expansion and construction?

A. There is absolutely no comparison in the action, either contracting or expanding, of the Swan patent or the Swan exhibit, with the Double or Wilson.

Q. 479. Is there any tilting action of the bits in the Swan reamer? A. No, sir; there is not.

Q. 480. Upon what is the Swan reamer dependent, in collapsed position of the bits?

(Testimony of Thomas J. Griffin.)

A. It is dependent upon the spring-actuated interlocking rod.

Q. 481. And how does this locking of the spring-actuated rod take place?

A. By an enlarged portion or enlargement of the spring-actuated rod shown in Figure 7, and the dowels, which have suitable slots, as shown in F2.

Q. 482. Is that a large or small F?

A. It is a large F, and small 2—in Figure 10. These pieces are made flat and long, with little projecting pins that fit into suitably drilled holes, that pass through from the outer surface of the body to the central portion, so that when the lugs, with their spring-actuated rod, are pulled down, these lugs are held in position by a suitable ring, as shown in Figure 9G, until the reamer is placed in the top of the casing; then these lugs shown in 10F come in contact with the walls of the casing, and are finally held in position, preventing the cutters from being pulled up until after these lugs F go below the shoe, when they are forced out, allowing the enlarging portion of spring-actuated mandrel rod to pass up between these points, and in the event that they don't hold, have a drive-down casing [499] spear, which in eight cases out of ten, based on my experience in running this tool into the hole, is the case. Sometimes I have gotten the tool almost to the bottom of the hole when this would take place, and in several instances, in trying to pull this reamer back out of the hole, to reset it, the lugs would become wedged

(Testimony of Thomas J. Griffin.)

or jammed, sticking the reamer in the hole, and having to pull the string of casing and the tool out. This Swan underreamer is nothing more than an inverted drive-down spear. There is no tilting or releasing-action upon the lugs—they remain stationary in a plane, moving only upwardly and downwardly, and are controlled by the spring-actuated rod. There being no slotted extensions which these bits work through, no tilting movement of the bits, no spreading of the bearing over which the cutters travel or work, I fail to find any comparison whatever in the Swan reamer with the Double and Wilson.

Q. 483. You have stated that this locking device in this Swan patent, and sample of Swan reamer, is depended upon to lock the spring-actuated rod in its lowermost position, permitting the bits to remain at the bottom end of the body. In what other exhibit do you find a similar locking device or a locking device for a similar purpose?

A. I find a similar locking device to the Swan in the O'Donnell & Willard; also in the North and the Kellerman.

Q. 484. From your experience with underreamers, Mr. Griffin, what have you to say as to the practicability of any underreamer which depends on a locking device for this purpose? A. They are useless.

Q. 485. Do you mean the locking device is useless or the underreamer?

A. The underreamer and the locking device both. I have never known of a single one that could be practically operated.

(Testimony of Thomas J. Griffin.)

Q. 486. Referring again to this Swan reamer, either as [500] exemplified in the Swan patent or the exhibit sample of Swan reamer, in what manner are the bits induced to spread out or expand?

A. An upwardly and outwardly inclined wedge, working in conjunction with the tension on the spring-actuated rod, with the key holding the cutters.

Q. 487. And what holds the cutters on this wedge?

A. Grooves or planes.

Q. 488. Are these what are referred to in the patent as the ways A7? A. Yes, sir.

Q. 489. These are the parts that have been referred to by William W. Wilson in his testimony, as dovetails, are they not? A. Yes, sir.

Q. 490. Have they any correspondence with the dovetails in the Double or Wilson underreamer?

A. Absolutely none.

In a conversation I heard between Mr. Tom O'Donnell and Thomas Crumpton in Coalinga in 1908 or the spring of 1909, Mr. O'Donnell asked Crumpton what he had done with the reamer. He stated that he had run it into the hole, kept it there a few minutes and when he pulled it out, found "the guts of the damn thing was in the hole." O'Donnell said, "Go ahead, I knew the damn thing was no account," and it was only another experiment. It is mine and is paid for [501] do whatever you please with it.

Cross-examination.

(By Mr. BLAKESLEE.)

Q. 498. Mr. Griffin, in "Complainants' Exhibit

(Testimony of Thomas J. Griffin.)

Wilson Underreamer," and Wilson Underreamer No. 2" will you please point out to me a hollow slotted extension at the lower end of the body of each of these exhibits?

A. I will. That is the hollow slotted extension. Mr. Blakeslee— Witness pointing to the space between what have been termed prongs at the lower end of the body of "Complainants' Exhibit Wilson Underreamer Number 2."

Mr. LYON.—I object to that. The witness did not point to the space, but he drew his foot from the bottom of the body of "Complainants' Exhibit Wilson Underreamer Number 2," to the top of the slot there through, evidently including the portion thus covered by his foot.

Mr. BLAKESLEE.—I object to this statement of what the witness did, in that it designates the opening as "slot."

Mr. LYON.—Well, ask the witness to state it in the record.

Q. 499. (By Mr. BLAKESLEE.) Will you, then, please, Mr. Griffin, define this alleged hollow slotted extension in the exhibit, by describing the exhibit as to its tangible portions, related structurally to such alleged hollow slotted extension?

A. First, by saying that this is a body of an underreamer mandrel, it having a hollow portion having been bored out, making it hollow, by placing it under a planer or milling machine, and milling a slot, beginning at the lower portion or end, upwardly about

(Testimony of Thomas J. Griffin.)

11 inches, and being about two inches wide, through from one periphery to the other, forming a slot.

Q. 500. Will you please give us your definition of a slot?

A. A slot is an opening that is cut out to receive some [502] other part, or to set over something, with an opening from one side to the other.

Q. 501. I now call your attention to an opening in the body of "Complainants' Exhibit Wilson Underreamer Number 2," just above the thrust-bearing at one side, where the upper end of the shank of one of the cutters bears against the body at that side, and will ask you to please define that opening?

A. I don't find the cutters striking against any such shoulders. The upper end of the shank of the cutters strikes against a shoulder, that is, in the upper part of the slotted extension.

Q. 502. Is the opening which I have referred to in the last previous question made clear to you as to its location?

A. I think not. If I have not answered it as you so desire, if you will explain it to me more fully I may understand it.

Q. 503. Well, I now place my pencil in an opening in the side of the body of this exhibit, just above the shoulder which is engaged by the upper end of the shank of the cutter at that side of this exhibit, and will ask you to please tell me what kind of an opening that is? A. That is a key-way.

Q. 504. Is it a slot?

A. It might be termed a slot.

(Testimony of Thomas J. Griffin.)

Q. 505. It has continuous, unbroken walls, has it not?

A. One way of speaking, it has; another way of speaking, it has not, as the walls are broken on the inside.

Q. 506. It has one continuous wall, has it not, extending around its sides and its ends, without a break? A. On its outer surface, yes.

Q. 507. The opening which you have referred to at the lower end of the body of this exhibit has no continuous wall extending [503] around it, to include both the ends and sides, has it?

A. As it is now, no. (Indicating.) As it now is, yes. (Indicating.)

Mr. LYON.—Just put in the record what you have done.

Mr. BLAKESLEE.—Witness inserts a retaining bolt at the lower end or adjacent to the lower end of the opening referred to, which was previously not in its position. This retaining bolt, of course, is in no way a part of the body, or integral part, is it?

A. Yes, sir; it is.

Q. 508. It is an integral part?

A. I don't know just what you mean by integral. It is a necessary part of the body.

Q. 509. It was not there when the opening was made, was it? A. It was not.

Q. 510. Now, which of these two openings just referred to, the lower or the upper, do you consider most properly as forming a slot?

A. The lower one.

(Testimony of Thomas J. Griffin.)

Q. 511. And for what reason?

A. For the reason that it has the elongated key-way cut in the body just above the bearing, thrust-bearing, which is just wide enough for the key to pass through, making it a key-way—just room enough in it for pushing in easily. If it had been made deeper then it might have been called an elongated slot.

Q. 512. Then, I take it, that whether a given opening is a slot or not, depends on the length, and also upon the dimensions of the part that fits into it, does it?

A. Well, if it was a long opening that was taken out, as, for instance, a strap on an engine crank pin, where a gib and a key is used, you might call it a slot; but there is no such thing [504] in this body; that is simply plainly a key-way, cut through sufficiently large to allow the key to enter.

Mr. BLAKESLEE.—I will ask the Examiner to read the question, please.

(Last question read by the Special Examiner.)

Q. 513. Please answer this question yes or no, and then make such further statement as you may wish.

A. Read the question again.

(Last question again read by the Special Examiner.)

A. No, this is not necessary. The word “slot” and “key” has been made to fit the person making the application.

Q. 514. Please state which of these two openings referred to in the lower end of the body of this ex-

(Testimony of Thomas J. Griffin.)

hibit most resembles the opening through the extension at the lower end of the body, "Complainants' Exhibit" or "Defendant's Exhibit Double Underreamer," such opening being confined entirely by the flat faces of such extension.

Mr. LYON.—The question is objected to as incorrectly defining the structure referred to.

Q. 515. (By Mr. BLAKESLEE.) Now, answer please. A. Please read the question.

(Last question read by the Special Examiner.)

A. I now state that the Wilson compares to the Double. With the bolt inserted through the slotted extension of the Wilson reamer, forms the integral part of the lower portion of the Double.

Mr. BLAKESLEE.—Please read that question, and I will ask the witness to answer it in terms.

(Last question again read by the Special Examiner.)

Mr. LYON.—The question is again objected to upon the ground stated in the preceding objection, counsel in his question having [505] disregarded the structure of the Double underreamer.

A. Now, what is that question, once more.

Q. 516. (By Mr. BLAKESLEE.) In order to more technically meet the objection of counsel to this question, if he wishes the question doctored as to technicalities for presentation to the witness, I will ask the question to be re-read, with the word "planes of the" inserted before the words "flat faces." Please re-read the question, so altered.

Mr. LYON.—Same objection noted.

(Testimony of Thomas J. Griffin.)

(Last question read by the Special Examiner as amended.)

A. Both.

A. 517. (By Mr. BLAKESLEE.) Then, I take it that you must mean to tell us that both of said openings referred to, adjacent to the lower end of body of "Complainants' Exhibit Double Underreamer" or "Defendant's Exhibit Double Underreamer," are the same kind, fall within the same definition; is that correct?

Mr. LYON.—Haven't you switched your exhibits?

Mr. BLAKESLEE.—Yes, I have,—“Complainants' Exhibit Wilson Underreamer” and “Complainants' Exhibit Wilson Underreamer Number 2,” instead of Double.

A. Now, what is my answer to that?

Mr. LYON.—You haven't answered it yet.

Mr. BLAKESLEE.—Your answer was “both” to the previous question.

A. Both; as the Double has a slotted extension extending from one periphery to the other; and “Complainants' Exhibit Wilson Underreamer Number 2” has a similar slotted extension, extending from one periphery to the other.

Q. 518. In “Complainants' Exhibit Wilson Underreamer Number 2,” which of the openings, the lower opening or the opening in the side just above it, most resembles the elongated opening [506] in the extension at the lower end of “Complainants' Exhibit Double Underreamer” or “Defendant's Exhibit Double Underreamer,” such opening being confined

(Testimony of Thomas J. Griffin.)

between the parallel planes of the flat faces at the sides of such extension?

Mr. LYON.—Objected to, as the question does not correctly state the structure of the Double exhibit referred to.

A. I will say that there is no comparison between these two. The key-way in the body of the Wilson is plainly a key-way, for a different purpose, and performs a different function to the slotted extension of the Double.

Q. 519. (By Mr. BLAKESLEE.) Then you see no similarity, do you, between either of these openings referred to, adjacent to the lower end of “Complainants’ Exhibit Wilson Underreamer Number 2,” and the elongated opening in the extension at the lower end of the body of “Complainants’ Exhibit Double Underreamer” or “Defendant’s Exhibit Double Underreamer,” such opening being that extending transversely of that extension, and confined between the planes of the flat parallel faces of that extension.

Mr. LYON.—The same objection is urged to this question, as the question eliminates from consideration that portion of the hollow as a large extension of the Double underreamer by which approach is secured to the plain surfaces referred to.

Mr. BLAKESLEE.—Just add there, eliminate for the present purposes, just exactly those spaces by which such approach is obtained.

Mr. LYON.—The question is then objected to as entirely irrelevant, immaterial and futile, as it elimi-

(Testimony of Thomas J. Griffin.)

nates part of the operative features of the hollow slotted extension.

Mr. BLAKESLEE.—Now, read the question, please.

(Last question read by the Special Examiner.)

A. I must take issue with counsel, that it is not confined. [507] The outer portion of the slotted extension has been enlarged for a purpose. There is no such comparison in the Wilson underreamer, “Defendant’s Exhibit Number 2,” and there is no such key-way in the Wilson reamer, “Complainants’ Exhibit Wilson Underreamer.”

Q. 520. Then, neither of these openings, I take it, in “Complainants’ Exhibit Wilson Underreamer Number 2” finds its counterpart in the extension of “Complainants’ Exhibit Double Underreamer” or “Defendant’s Exhibit Double Underreamer”?

A. The counterpart of the slotted extension of Wilson underreamer, compares with the counterpart of the slotted extension of the Double underreamer, with the exception that one is larger than the other—wider.

Mr. LYON.—Just note there that the witness in giving those last answers runs his pencil through the lower end of “Complainants’ Exhibit Wilson Underreamer Number 2,” where the bits or cutters operate, and similarly through the similar part of “Complainants’ Exhibit Double Underreamer.”

Q. 521. (By Mr. BLAKESLEE.) Now, I am not talking at all about extensions in either reamer, as far as masses of metal are concerned. I am talking

(Testimony of Thomas J. Griffin.)

about the openings in such extensions, and I will again ask you to please tell me if you find on "Complainants' Exhibit Double Underreamer" or in "Defendant's Exhibit Double Underreamer," in the extension at the lower end, any such opening in kind as is found adjacent to the lower end of "Complainants' Exhibit Wilson Underreamer Number 2."

Mr. LYON.—I will ask counsel to define what he means in the question by the words "in kind."

(Last question read by the Special Examiner.)

Mr. BLAKESLEE.—Just state, I think the question is clear, and do not wish to further elaborate this interrogatory, but wish the witness to answer it in present form. [508]

A. Mr. Examiner, I shall have to ask counsel to tell me whether he has reference to the portion of the Wilson as directly below the retaining pin, that passes through the slotted extension of the Wilson reamer; and, with that explained to me, I may be able to answer his question.

Q. 522. I refer to the entire opening across which the retaining pin passes or extends, and also and furthermore to the opening I have previously referred to in this exhibit, in the side of the body a little above the upper end of the opening which the retaining pin extends across.

A. Do you mean in this question the key-way that passes through the body of the Wilson reamer, "Complainants' Exhibit Number 2," just above the thrust-bearing, comparing it with the hollow slotted extension of the Double reamer, or do you have refer-

(Testimony of Thomas J. Griffin.)

ence to that portion of the body of the Wilson reamer, "Complainants' Exhibit Number 2," just below the pin and the metal which forms an integral part of the lower portion of the Double?

Q. 523. I will ask the witness to answer the question. I believe that he can understand it. If he cannot, he can say so, and can answer accordingly.

A. I have clearly stated that I did not understand the question; and ask the counsel to explain to me what part of the body he had reference to, and will now ask that the Examiner re-read the original question.

(Question read by the Special Examiner as follows: "Then, neither of these openings, I take it, in "Complainants' Exhibit Wilson Underreamer Number" finds its counterpart in the extension of "Complainants' Exhibit Double Underreamer" or "Defendant's Exhibit Double Underreamer"?)

A. Yes, it finds its counterpart. The counterpart of [509] the slotted extension of the Wilson reamer is identically the counterpart of the slotted extension of the Double.

Q. 533. Is the hollow present in "Complainants' Exhibit Wilson Underreamer" now at the lower end of the body, beneath a transverse plane lying on the shoulders which receive the thrusts from the upper end of the shanks of the cutters?

A. There certainly is the hollow in "Complainants' Exhibit Wilson Underreamer Number 2," also in "Complainants' Exhibit Wilson Underreamer,"

(Testimony of Thomas J. Griffin.)

at the upper end of the thrust-bearings, extending on upwardly in the body.

Q. 534. I will ask the question to be re-read, and answer yes or no.

(Last question read by the Special Examiner.)

A. Yes.

Q. 535. Is there also a slot in the lower end of the body of "Complainants' Exhibit Wilson Underreamer Number 2," beneath the plane which lies in the shoulders which take the thrusts from the upper end of the shanks of the cutters? A. Yes.

Q. 536. Please tell me where the hollow is, and also where the slot is.

A. Why, the hollow is inside the body, and the slot goes through from one periphery to the other.

Q. 537. And the hollow is inside of the body, above the transverse plane which lies on the faces and shoulders of the body which received the up-thrust from the upper ends of the shanks of the cutters, is it not? A. Yes.

Q. 538. Then, below that plane, just referred to, of "Complainants' Exhibit Wilson Underreamer Number 2," there is no hollow, but only a slot, as you define it, is there? [510]

A. I didn't say that. I said that it was a hollow, beginning at the lower portion, which was left optional with the mechanic who was constructing this reamer as to the size of this hollow; and in "Complainants' Exhibit Wilson Underreamer Number 2" there is a hollow below such portion described by counsel.

(Testimony of Thomas J. Griffin.)

Q. 539. And also a slot? A. And also a slot.

Q. 540. Well, please tell me where the hollow begins and ends off, and where the slot begins and ends off.

A. The hollow begins at the lower end of the reamer body, at its spreading point, and continues up into the body sufficiently far to allow a spring and spring-actuated T-rod to be inserted; and the slot begins at the lower end of the reamer, beginning at the extreme points of the spreading-bearing, and continues up for any desired distance that the mechanic constructing this tool desires the cutter shanks to be.

Q. 541. Now, do you find any metal between the hollow and the slot beneath the poane which lies in the lower faces of the shoulders of the body in "Complainants' Exhibit Wilson Underreamer Number 2"?

A. Yes; I do.

Q. 542. Please point out with your finger that metal.

A. This is it. This large portion of the T which carries the cutters, and acts, and is for substantially the same purpose as the metal on the inner shoulders formed by the smaller size slots in the slotted extension of the Double reamer. This portion in the Wilson is removable—

Q. 543. And that T— I think you have testified—

A. Just one moment, please. I haven't got through.

Q. 544. All right.

A. Further I find a removable retaining bolt

(Testimony of Thomas J. Griffin.)

through this [511] body, that is just below the inner faces of the dovetails.

Q. 545. And then, I take it, that that removable pin or retaining pin in between the hollow and the slot in "Complainants' Exhibit Wilson Underreamer Number 2"; is that correct? A. Yes, sir.

Q. 546. And, as I understand your previous testimony, the metal which you have referred to on the spring-actuated rod on "Complainants' Exhibit Wilson Reamer Number 2," namely, the lower end of the rod and its T, perform the same office as the key which supports the cutters in "Complainants' Exhibit Double Underreamer" and "Defendant's Exhibit Double Underreamer." Is that correct?

A. It has two functions. One is the purpose of carrying the inner thrust of the shanks of the cutters, which is the flat parallel surface, which performs the same function as the solid metal portion that is formed by the small or slotted extension, which is a part of the continuation of the hollow slotted extension of the Double; and the other provides a key for the carrying of the cutters up into their position, actuated by the spring.

Q. 547. And the hollow, as you have defined it in the process of forming the opening at the lower end of "Complainants' Exhibit Wilson Underreamer Number 2," would extend directly through the retaining pin of this exhibit and directly through the T, would it not—that is, longitudinally of the reamer?

A. It would not be necessary to remove this retain-

(Testimony of Thomas J. Griffin.)

ing pin to put this hollow slotted extension in the Wilson reamer. That could be very easily placed in there prior to the forming of these hollow slotted extensions, as the hollow is so much larger in the Wilson than in the Double. Simply they could be planed in there, and this retaining bolt remain in position. That would [512] not have to be removed.

Q. 548. Will you please explain to me how you could drill or produce the hole up into the body of "Complainants' Exhibit Wilson Underreamer Number 2," over the lower end of the body, with the retaining pin and the T in place?

A. I didn't say that the T would be in place. Neither did I say that in boring the hollow that the pin was in position. I said that it was not necessary to remove the pin from the lower end of the body to form the hollow slotted extensions, as previously the hole would have been bored in there before you could have inserted the T-spring-actuated rod.

Q. 549. Then, I take it that the retaining pin and the key extend across the hollow in this exhibit, do they not? A. They do.

Q. 550. And also that they extend across the slot in this exhibit, do they not? A. They do.

Q. 551. Now, is there anything which forms—

A. I beg pardon. The key does not extend across the slot; it extends through the slot. But the retaining bolt extends across the slot.

Q. 552. Is there any metal in the hollow or in the slot you have defined, between the retaining pin and

(Testimony of Thomas J. Griffin.)

the T? A. Yes, there is metal there.

Q. 553. And what is it? A. Part of the body.

Q. 554. Now, my question was, in the hollow, not at the sides of the hollow.

A. In the hollow there is none.

Q. 555. Then the slot and the hollow have no defining wall between them, have they, at which you can say the slot commences [513] and the hollow ends? A. I think so.

Q. 556. What is that?

A. Same as shown on the Double,

Q. 557. What?

A. The upper shoulders or the portions formed to receive the upper shoulders, the shoulders of the cutters, is the upper part of the slot, and the retaining bolt is the lowest part of the slot.

Q. 558. And the hollow?

A. Is between the two.

Q. 559. And where is the slot?

A. The slot is from one periphery to the other.

Q. 560. And joins with the hollow?

A. And joins with the hollow. Identically the same with the Double,

Q. 561. And, aside from the T and the retaining bolt, there is nothing in the slot or in the hollow, is there? A. No, sir.

Cross-examination.

(By Mr. BLAKESLEE.)

Q. 562. If, as you have testified, the hollow is first produced in the Wilson underreamer at the lower end, below the shoulders on the body, which receive the

(Testimony of Thomas J. Griffin.)

upthrust from the upper ends of the shanks of the cutters, what becomes of this hollow after the slot is formed?

A. A portion of it in the "Complainants' Exhibit Wilson Underreamer," and "Complainants' Exhibit Wilson Underreamer No. 2," still remains.

Q. 563. Does a portion of it remain beneath the shoulders on the body? [514] A. It does.

Q. 564. How much of it remains beneath those shoulders?

A. Probably from an eighth of an inch to a quarter in depth.

Q. 565. And is that part distinct from the slot?

A. No.

Q. 566. The same space constitutes part of the slot and part of the hollow, does it not?

A. Yes, sir.

Q. 567. Then, in so far as the space entering into the hollow and slot are concerned, that is, the space which is common to both, the hollow and slot throughout that space are one and the same thing, are they not? A. Yes.

Q. 568. Now, I will ask you—

A. Just a moment. I wish to say that this hollow and slot, as referred to, applies to the Double reamer, "Defendant's Exhibit Double Underreamer," and "Complainants' Exhibit Double Underreamer," of the different types that I have testified to in this case, the same as the Wilson.

Q. 569. Now, will you please describe to me carefully the hollow in "Complainants' Exhibit Double

(Testimony of Thomas J. Griffin.)

Underreamer," or "Defendant's Exhibit Double Underreamer," and then describe to me the slot in the same reamers.

A. The hollow in the Double underreamers, "Complainants' Exhibit" and "Defendant's Exhibit Double Underreamer," commences at the lower portion of the body and extends through to the upper end of the mandrel in two sizes, the larger portion of the hollow terminating just above the thrust-bearings of the hollow slotted extension, made of any suitable size to receive the spring and spring-actuated rod, forming a shoulder for the spring; thence passing through the lower portion of the body smaller in [515] diameter. The slot starts from the lower end of the mandrel and extends up to the shoulders and is planed out to a sufficient depth and width to allow the shanks of the cutters to enter, and then milled through into the hollow portion. The tool is then turned over and the milling process and the planing process is continued until the hollow slotted extension is completed, forming one continuous, unbroken slot from the periphery of the tool down and through the slot on the opposite side to the same periphery of the other side of the body. In the forming of this hollow slotted extension the outside or spaces planed in for the receiving of the cutters, go from the end to the shoulder. The central portion of the body then is slotted and the lower part is left intact for the purpose of retaining the key or T spring-actuated rod from coming out if any accident should happen to the reamer, and is there for

(Testimony of Thomas J. Griffin.)

the purpose of a safety device identically the same as "Complainants' Exhibit Wilson Underreamer" and "Complainants' Exhibit Wilson Underreamer No. 2."

Q. 570. And the hollow in "Complainants' Exhibit" and "Defendant's Exhibit Double Underreamers" in the hollow slotted extension received the lower end of the spring-actuated rod in a close fit and guides it in its play, does it not?

A. Yes, identically the same, and for the same purpose, and the same construction as there is in the Wilson Complainants' Exhibit Underreamer and "Complainants' Exhibit Wilson Underreamer No. 2."

Q. 571. Show me any such construction beneath the shoulders on "Complainants' Exhibit Wilson Underreamer" or "Complainants' Exhibit Wilson Underreamer #2."

A. Before answering the question I will have to modify my previous answer to the extent of the Wilson underreamer—"Complainants' Exhibit Wilson Underreamer"—as the construction [516] of the T-rod is different from "Complainants' Exhibit Wilson Underreamer No. 2." And will now proceed to show to counsel the hollow slotted extension referred to.

Q. 572. Now, Mr. Griffin, remember that I have specified as to the location of this hollow slotted extension, that it is beneath the shoulders which receive the upthrust on the upper ends of the shanks of the cutters.

(Testimony of Thomas J. Griffin.)

A. That is exactly what I understand your words, and therefore I will proceed to show it. If counsel will come here I will show it to him.

Q. 573. I want you to describe it in your own language; the exhibits speak for themselves.

A. The body of "Complainants' Exhibit Wilson Underreamer No. 2" has been bored out and a portion of that bore still remains in the body which forms a hollow, and it has in this exhibit—or in this exhibit still remains a portion of the hollow.

Q. 574. And beneath the shoulders on the body which I have specified?

A. Beneath the shoulders on the body that you have specified.

Q. 575. And is the spring-actuated rod snugly received in that hollow beneath those shoulders?

A. It is a loose working fit.

Q. 576. And as far as that fit is concerned, it is just as loose a fit as if you consider the slot in that Wilson reamer the hollow, is it not? A. No.

Q. 577. Please show me in what manner the hollow fits the rod beneath the shoulders differently from the fit of the slot beneath the shoulders. [517]

A. The hollow is circular in form and the slot is formed across and through the hollow.

Q. 578. And they both have the same side confining walls, have they not?

A. The slot has no confining walls. The hollow has confining walls.

Q. 579. In other words, the slot is an entirely open space with no walls around it, just like part of the middle of a room?

(Testimony of Thomas J. Griffin.)

A. Well, I have described this particular reamer as having a hollow in the center and a portion of the body remains around the hollow.

Q. 580. In other words, I take it the hollow lies in the slot in the same manner that you might consider a smaller bunghole lies within a larger bunghole—is that it?

A. No, there is no bunghole considered in this, and we are not discussing bungholes. We are discussing a hollow; and a hollow might be round or it might be square, in this instance, and originally it was round.

Q. 581. Well, then, please describe definitely what it is, if anything, that separates the slot from the hollow at any point in the Wilson underreamer beneath the shoulders on the body.

A. There is nothing that separates the hollow from the slot.

Q. 582. And then you cannot point out to me, I assume, where the hollow stops and the slot commences?

A. Why, I did not say that. I certainly can point out to you where the hollow starts and the slot commences.

Q. 583. No, where the hollow stops and the slot commences.

A. Where the hollow stops and the slot commences?

Q. 584. Exactly. A. I can. [518]

Q. 585. Please describe that point or region or zone, or whatever else it may be.

A. The hollow starts at the end of the reamer and

(Testimony of Thomas J. Griffin.)

continues up into the body. The slots commence at the end of the reamer and continue up to their shoulder.

Q. 586. You have not yet pointed out to me where the hollow stops and the slot commences. You have admitted that there is no wall or defining separation between the slot and the hollow. Now, please point out where one ends and the other commences.

A. The hollow ends at any suitable distance in the body as the mechanic constructing it sees fit to drill it, and commences at the lower portion of the mandrel. The slot commences at the lower portion of the mandrel and the ends at the shoulders.

Q. 587. And they both utilize the same space, do they not?

A. They both utilize the same space? Partially. They are in the same body.

Q. 588. And there is no metal barrier or wall which marks the place below the shoulder where one ends and the other immediately begins, is there?

A. Not exactly. You put the T-rod in.

Q. 589. And when you have to put in the T-rod, have you separated the slot from the hollow?

A. That would be owing to how you want to construe it.

Q. 590. No, I asked you directly, and I want an answer yes or no as to that; and you may state afterwards, if you wish, anything further.

A. Read the question. (Question No. 589 read.) No.

Q. 591. And when you have put the retaining bolt

(Testimony of Thomas J. Griffin.)

in at the bottom, have you separated the slot from the hollow? A. No. [519]

Q. 592. In either "Complainants' Exhibit Double Underreamer" or "Defendant's Exhibit Double Underreamer," your slot comprises two broader portions connected by a contracted portion, does it not?

A. Yes.

Q. 593. And that contracted portion is in a continuation of the body which goes clear to the lower end of the reamer?

A. I did not say the contracted portion went to the lower end of the reamer.

Q. 594. Read the question again, please. (Question No. 593 read.)

A. I shall have to reply again, I did not say it went to the lower portion of the body.

Q. 595. I asked you if the contracted portion of the slot in the Double reamer does not lie in a portion of the body which goes clear to the bottom of the reamer.

A. That is correct.

Q. 596. And the hollow in the Double underreamer, in either of the said exhibits, beneath the shoulders which receive the thrust from the upper ends of the shanks of the cutters, is entirely confined within this extension of the body through which the contracted portion of the slot is cut, is it not?

A. I will have to say that I do not understand counsel's words or meaning, and ask him to please define what he has reference to.

Q. 597. This portion of this extension of the body clear to the lower end of the body in the Double

(Testimony of Thomas J. Griffin.)

reamer, through which extension the contracted portion of the slot is formed, is borne upon by the cutters at its lower end when the cutters are tilting, is it not?

A. Yes. [520]

Q. 598. And its parallel side faces are borne upon by the cutters at their inner faces, or at the shoulders on their inner faces, during parts of the contracting and expanding movements of the cutters, are they not?

A. It is owing to what exhibit you have reference to.

Q. 599. In both "Complainants' Exhibit Double Reamer" and "Defendant's Exhibit Double Underreamer"? A. Yes.

During the expansion of Double underreamer cutters they do not engage with the dovetails of the reamer body. The cutters cannot contact with the dovetails when expanding as the casing shoe prevents them from doing so. They may contact or expand without the dovetail, therefore they are not dependent on the dovetails for their contraction or expansion. However, there is a difference in the expansion or contraction of the cutters when they are in working position in the hole. The binding or contact is then against the cutting edge of the cutters, or at lower end of cutters, hence they do tilt out at the upper end so that the cutters then contact against dovetails, when expanding. They also slide upon the key when contracting or expanding. That is I refer to the Double cutters. This sliding upon the key is produced by the upwardly inclined dovetails.

(Testimony of Thomas J. Griffin.)

So that the dovetails of the Double underreamer cutters contact with the upwardly and inwardly inclined dovetails on the reamer body when contracting or expanding when in actual reaming operation. However, that is not the case when contracting when being withdrawn into the casing.

Q. 621. There is a portion of the expanding movement of the cutters when the shoulders on the inner faces of the cutters are in engagement with the parallel flat faces of the hollow slotted extension, is there not? [521] A. Yes.

Q. 622. And what is it that causes the tilting action of the cutters during that part of their expansion?

A. The slipping up over the end of the mandrel.

Q. 623. Is that all?

A. I think so. I think that answers the question.

Q. 624. I am now referring to that portion of the expanding movement of the cutters when the shoulders are up above the lower tapered portion of the mandrel, or hollow slotted extension, so that those shoulders engage with the parallel flat faces of the hollow slotted extension, is there not a continuation of the tilting action of the cutters in their expansion when the shoulders are on those flat parallel faces?

A. Do you have reference to when the tool is operated in a pinched hole, or have you reference to a tool being expanded and contracted in the casing or shoe?

Q. 625. I am referring to the completion of the expanding action under any and all conditions.

A. Well, if the tool is being expanded and contracted normally by going in and out of a shoe, there

(Testimony of Thomas J. Griffin.)

is no such movement; but if the tool is being expanded and contracted owing to the operation of the tools in a hole, and the hole pinching on the ends of the cutters, then the upwardly and inwardly inclined dovetails act upon the cutter and assist it in expanding and allows it to contract, but does not assist it in contracting.

Q. 626. When you gave the answer "correct" to the following question, your answer was wrong, was it not, the question being as follows: Question No. 274: "Then, if I understand you correctly, so far as the expansion of the cutters is concerned the inclination or taper of the dovetails has nothing to do with the expansion of the bits or the mode of their co-operation with the [522] body of the reamer in such expansion?"

A. That answer is correct, and I meant what I said, and I wish to go on record and say that counsel did not define whether he was in normal expanding and contracting those tools or whether he had them in the well in a pinched condition; and in other previous answers to that same question I have defined it as being a separate and distinct mode of operation.

Q. 627. And in the expansion and contraction of the cutters when the underreamer is out of the hole, or an expansion and contraction of the cutters of this same Double underreamer, when it is in the hole beneath the shoe on the casing, there is nothing to prevent the dovetails on the cutters from engaging with the upwardly and inwardly inclined dovetails on the hollow slotted extension, is there?

(Testimony of Thomas J. Griffin.)

A. No, there is nothing to prevent them.

Q. 628. And if they do so interengage, these upwardly and inwardly inclined dovetails on the hollow slotted extension must assist in *in* the tilting of the Double cutters, must they not? A. No.

Q. 629. And why?

A. Because it is not necessary, for the pressure brought to bear upon the points of the cutters. The points of the cutters do not strike, and it will expand and contract over that body there without any dovetails.

Q. 630. Is there anything to keep the dovetails out of interengagement?

A. No, neither is there anything there to keep them in engagement.

Q. 631. What limits the outward swing of the upward ends of the shanks of the Double cutters when they are being expanded irrespective of the shoe, leaving that out of consideration? [523]

A. There is nothing except the tension of the spring and the key.

Q. 632. And the upper ends of the shanks of the cutters slide on the key, do they not?

A. No, not normally.

Q. 633. Leaving the shoe out of consideration.

A. And in answer to that I shall have to say no, not normally; but in pinching, yes.

Q. 634. Now, if the upper ends of the shanks do not slide on the key, how do the cutters tilt at all?

A. They do not tilt. They roll. Or tilt, either, as you desire the answer, either one.

(Testimony of Thomas J. Griffin.)

Q. 635. Then in tilting, the upper ends of the cutters must move inwardly and outwardly along the key, do they not?

A. The upper ends of the cutters do tilt inwardly and outwardly.

Q. 636. And where they engage with the key they move inwardly and outwardly along the key, do they not?

A. Where the fulcrum comes on the key in the slot, from that point upward to the upper end of the shank, they tilt inwardly and outwardly.

Q. 637. Now, is that the only fulcrum employed in the tilting of the cutters of the Double underreamer?

A. Yes, unless you want to call the spreading-bearing a fulcrum.

Q. 638. Is there not a fulcrum at each of the shoulders on the inner faces of the cutters?

A. No.

Q. 639. Isn't there a center of tilt or oscillation at the shoulder of each of the cutters when that shoulder is causing the expansion or contraction of the cutter? [524]

A. There is no oscillation.

Q. 640. There is no oscillation at those shoulders?

A. No, there is no oscillation, if I understand the word oscillation.

Q. 641. Does not the lower end of the cutter swing inwardly, that is, the portion below the shoulder on the cutter? A. That is correct.

Q. 642. And does not the upper end of the cutter swing outwardly, that is, the portion that is above

(Testimony of Thomas J. Griffin.)

the shoulder on the cutter?

A. It is a tilting movement.

Q. 643. Just a moment. I am not through yet. In the contraction of the cutter.

A. That is a tilting or teetering motion, but no oscillation.

Q. 644. Where is the center of that tilting or teetering motion?

A. Hinged upon the key; centered upon the key.

Q. 645. And there is no fulcrum between the part of the cutter which tilts outwardly and the part of the cutter which tilts inwardly?

A. There is a shoulder.

Q. 646. Isn't there a fulcrum upon it at that shoulder? A. Yes, if you wish to call it that.

Q. 647. Now, if there is such a fulcrum upon that shoulder and the lower end of the cutter swings inwardly, with that fulcrum as a center, and the upper end of the cutters swings outwardly with that fulcrum as a center, must not the upper end of the cutter travel outwardly along the key which supports it?

A. No and yes. The upper end of the cutter, as I have before stated, above the key tilts outwardly, and the lower portion tilts [525] inwardly; and in normal expanding it has no sliding movement on the key perceptible.

Q. 648. I will ask that that question be re-read. (Last question read.)

A. No, not along on the key.

Q. 649. In other words, it stays stationary on the key, does it?

(Testimony of Thomas J. Griffin.)

A. In its normal condition, normal expanding and contraction, yes.

Q. 650. It stays stationary on the key at the same time that it moves outwardly, does it; that is, the upper end of the cutter?

A. I have not said it did not tilt. I have said it tilted.

Q. 651. I am not asking about tilting. I am asking about an actual movement away from the center of the spring-actuated rod. Is there not such an actual outward movement of the upper end of the cutter when the cutter is tilting on the shoulder or its inner face as a fulcrum?

A. Unless I have answered this question I shall have to say that I do not know how to answer it.

Q. 652. That is sufficient of an answer if that is the best you can give. Now, in the commencement of the collapsing action of the cutters in the Wilson underreamer, in either "Complainants' Exhibit Wilson Underreamer," or "Complainants' Exhibit Wilson Underreamer No. 2," there is a movement of the shoulders on the cutters downward over inwardly inclined surfaces, is there not? A. Yes.

Q. 653. In the commencement of the collapsing action of the cutters, the Double underreamer, in either Complainants' Exhibit Double Underreamer" or "Defendant's Exhibit Double Underreamer," cutters over any downwardly and inwardly inclined [526] is there any movement of any portion of the surface?

A. I shall have to ask you to define whether you

(Testimony of Thomas J. Griffin.)

mean in actual working conditions or whether expanding normally or not.

Q. 654. Under any conditions whatsoever.

A. On the Wilson underreamer there is a tendency under any condition for the points of the bits to begin to come together, contract, as soon as they start down this incline, owing to the taper bearing which is mechanically speaking, for the same purpose as the upwardly and inwardly inclined dovetails of the Double, you have the motion in the Double if you desire it.

Q. 655. In the Wilson the bearing shoulders on the cutters always engage with the downwardly and inwardly inclined upper spreading-surfaces, so that there is a positive production of a tilting action at the commencement of the collapsing, is there not?

A. In the Double or Wilson?

Q. 656. In the Wilson. A. Oh, yes.

Q. 657. Please point out to me in the Double underreamer, in either of the exhibits, complainants' or defendant's, any such downwardly and inwardly inclined surfaces with which the cutters coengage at the very commencement of the collapsing action of the cutters.

A. There is no such on the Double that forces the contraction of the points of the cutters. It is there, if you want it.

Q. 658. Then, the mechanical construction of the two reamers, the Double and Wilson, in this respect is different, is it not?

A. No. They are simply two inverted—one angle

(Testimony of Thomas J. Griffin.)

in one way, and the other one the other; the opposite, rather. [527]

Q. 659. Referring to the inwardly inclined cut-away portions at the upper ends of the shanks of the Wilson underreamer, do these engage with any inclined surfaces to cause a tilting action of the cutters?

A. They do not engage in any inclined surfaces, but if they were not there the Wilson underreamer would not contract.

Q. 660. But the contraction is entirely caused by the movement of the side shoulders on the cutters over the inclined surfaces of the lower end of the body of the Wilson underreamer, entirely beneath the dovetails, is it not?

A. It is allowable owing to the fact that the upper end of the shank, the dovetails of the shank, of the Wilson cutter, being cut away.

Q. 661. I will ask the question to be read and answered.

(Last question read.)

A. Yes, they would not contract unless this portion of the cutter had been cut away.

Q. 662. And that cutting away is merely to allow, and not to assist, the tilting action, is it not?

A. Well, if it allowed it, it certainly would assist it; without it it could not; and with it, it can.

Q. 663. Well, then, put it this way, the cutting away of the upper end of the shanks of the Wilson cutters simply allows the tilting and does not cause the tilting of the cutters—is that not correct?

(Testimony of Thomas J. Griffin.)

A. Yes.

Q. 664. And under no circumstances either due to the pinch, or anything else, can the parallel dovetails on the body of the Wilson underreamer cause tilting of the cutters by engagement with the dovetails on the cutters—is that not correct? [528]

A. Yes, that is correct.

Q. 665. Now, you have admitted, I believe, that there is a certain portion of the tilting action of the cutters in Double underreamers produced when the shoulders on the inner faces of the cutters are in engagement with the flat parallel faces on the hollow slotted extensions?

A. Just a moment, I have done nothing of the kind, only under certain circumstances, certain conditions.

Q. 666. Do I take it, then, that all of the tilting of the Double cutters is produced by the engagement of the shoulders with the inwardly inclined faces at the very bottom of the body of the Double reamer?

A. Correct.

Q. 667. And there is normally no tilting action after the shoulders on the inner faces of the cutters have passed from these surfaces onto the flat parallel faces of the hollow slotted extension?

A. When the reamer is expanded and contracted normally there is none.

Q. 668. In other words, while these shoulders pass upwardly over these flat parallel faces there is no tilting action of the cutters in the Double underreamers.

(Testimony of Thomas J. Griffin.)

A. Only when the reamer is being pinched in the hole.

Q. 669. And yet there is nothing to keep the upper ends of the dovetails on the shanks of the Double cutters from the upwardly inwardly inclined portions of the dovetails on the hollow slotted extension? A. Yes, the shoe.

Q. 670. Then, eliminate the shoe from consideration, and consider the operation without the shoe bearing upon the cutters, and what have you to say? [529]

A. Then in that event, if the hole was large enough, the cutters would contract and expand normally and there would be no tilting action.

Q. 671. Now, after the Double cutters have become somewhat worn on their outer faces, do you take it that the shoe still pinches on these cutters in the expanding and contracting actions?

A. I have never said that the shoe pinched on it.

Q. 672. Do you take it that the shoe engages with the outer face of the cutters under those circumstances?

A. At their lower points, no; only the sides or riding surfaces.

Q. 673. Now, when the reamer is in use beneath the shoe, am I to understand that the cutters remain expanded at all times under all conditions, whether working in mud or any other formation? A. No.

Q. 674. To the best of your understanding, there is a repeated contraction and expansion of the cutters under those circumstances beneath the shoe, is there

(Testimony of Thomas J. Griffin.)

not? A. As the bind comes onto the cutters, yes.

Q. 675. A bind on what?

A. The bind of the walls—binding against the walls or the mud thickens up very thick and dry.

Q. 676. And under those circumstances there is nothing to keep the upper ends of the dovetails on the shanks out of engagement with the upwardly and inwardly inclined dovetails on the hollow slotted extension, is there?

A. They certainly become engaged at that time.

Q. 677. And that being so, while the shoulders on the inner faces of the cutters are riding over the flat parallel faces of the sides of the hollow slotted extension, in Double underreamer, with the upper ends of the dovetails on the shanks of the cutters in engagement with the upwardly and inwardly inclined [530] dovetails on the hollow slotted extension, a tilting action of the cutters takes place, does it not? A. It does.

Q. 678. In both contracting and expanding; is that not so? A. It does.

Q. 682. But the interengaging dovetails on the cutters of the body do not cause this tilting action under these circumstances in the Wilson underreamer, do they? A. No.

Q. 683. And what you have referred to in the operation of the Wilson underreamer, like "Complainants' Exhibit Wilson Underreamer," cannot take place in the use of the Wilson underreamer like "Complainants' Exhibit Wilson Underreamer No. 2," can it? A. No, only partially.

(Testimony of Thomas J. Griffin.)

Q. 684. Then, I take it that all of the expansion and contraction of the cutters in Wilson's underreamer of either type is caused by the engagement of the shoulders on the sides of the cutters with the two sets of inclined spreading surfaces, the upper and lower; is that not correct? A. No.

Q. 685. What else is there in the Wilson underreamer that causes this tilting action of the cutters?

A. The spreading-bearing.

Q. 686. And where is that?

A. At the lower portion of the body.

Q. 687. That is exactly the part that I have referred to, namely, the spreading-bearing which includes the upper pair of slightly outwardly and upwardly inclined spreading-surfaces, and the lower pair of sharply upwardly and outwardly spreading-surfaces. Now, these two pairs of spreading-surfaces cause all the tilting of the cutters in the Wilson underreamer, do they not? [531] A. Yes.

Q. 688. And the dovetails on the body of the Wilson underreamer do not enter into the causing of the tilting of the cutters at all? A. No.

Q. 689. Then, do you not consider that there is a difference in the method of operation of the Double and Wilson underreamers in these respects?

A. None whatever. Mechanically speaking, they are identical.

Q. 690. Mechanically speaking, they are identical in spite of the mechanical differences; is that correct?

A. I do not see any mechanical differences. There

(Testimony of Thomas J. Griffin.)

is a slight difference in the degrees and angles and points that they are situated, but mechanically they are the same and have the same action.

Q. 691. And in their manner of performance are they the same? A. They perform the same work, yes.

Q. 692. But they don't work the same way?

A. With the exception of the action that we have just been discussing they work the same way; that is, the sliding down the downwardly inclined ways of the Wilson and the tilting action of the Double.

Q. 723. Now, in the use of the Double underreamer, like "Complainants' Exhibit Double Underreamer," the laterally projecting shoulders on the cutters do not normally engage with the inclined surfaces of the dovetail notches at the sides of the body, do they?

A. No.

Q. 724. Can they so engage with these surfaces unless the cutter itself bends? [532] A. Yes.

Q. 725. And how?

A. By being driven up into the body or the end of the shank becoming battered down, allowing it to be engaged.

Q. 726. In other words, the shank or the cutter must be mutilated or changed in formation in order for these surfaces, these inclined surfaces of the V-shaped notches, to be of any service; is that correct? A. Either that or bent.

Q. 727. And normally they cannot act as preventers to prevent—oppose any movement of the cutters outwardly? A. No.

(Testimony of Thomas J. Griffin.)

For fifteen or sixteen months I have been associated with Mr. Edward Double. I have several patents pending in which Mr. Double is interested. One of them relates to underreamers.

Q. 737. And have you not some sort of an understanding with Mr. Double that the exploitation or marketing of this underreamer will depend somewhat upon the success of the complainants in this suit?

A. Positively no; it has nothing to do with it, and I never knew anything about this suit until last October, about the 13th to the 20th; and neither has Mr. Double ever solicited me in any way, shape, form, or fashion, to testify in this case. I have not been employed by Mr. Double so to do; neither does my invention in anything pertain in any way, form or fashion, to defendant's underreamer, nor has it any part of that underreamer embodied therein.

Yes, I am receiving pay from Mr. Lyon (counsel of this suit) for my services. I am receiving only three dollars a day and expenses for my testimony. I receive pay from no other source for my service in connection with this suit. I expect to receive pay from no other source. With one exception there are [533] no prospects in my engaging in business with Mr. Double.

Q. 759. And any tendency of the cutters to spread, due to the action of any agency causing—tending to wedge them apart, cannot be taken up by the engagement of the shoulders at the sides of the cutters with the V-shaped notches, can it?

A. First, the shoulders engage with the—or the

(Testimony of Thomas J. Griffin.)

dovetails, rather, engaging with the dovetails of the cutters take up the initial part of the spreading-action, and if it bends or has a tendency to rip, the V-shaped notches then come into contact.

Q. 760. In other words, there must be a bend in the cutter or an actual ripping before this engagement takes place?

A. Before such action the cutter may become bent, or the dovetails on the body of the reamer, or the dovetails on the cutter, may become bent or disarranged; in that event, the notches would come into contact.

Thus they cannot prevent spreading of cutters.

It is not the intent, as I understand it, that any of the up-thrust of the Double improved cutters be taken by this V-shaped notch.

Q. 764. Then, in such a new underreamer, the only thrust that could be taken up by the side surfaces of the body at the lower end is the in-thrust of the cutters; is that not correct? A. That is correct.

Q. 765. And that is the same thrust which is taken from the cutters of "Complainants' Exhibit Wilson Underreamer No. 2" in the upper inclined spreading-surfaces, is that not correct?

A. Yes, that is correct.

In my experience I have never bent a cutter of the Double underreamer, never had the cutters bend outwardly. From my experience these V-shaped notches would very infrequently come into service, if at all, from such binding of the cutters. [534]

I have seen Double underreamers broken in every

(Testimony of Thomas J. Griffin.)

conceivable place that a reamer could be broken in, I presume, and bent. I have seen Double cutters bent. I never saw a Wilson underreamer cutter bent outwardly. It would hardly be possible to bend outward the cutters of the Wilson underreamer under normal condition to be met with, because of its extreme thickness of shanks.

Now the Double Cutter, because of its very construction, is more likely to bend in the shank than the Wilson cutter. The V-shaped groove at the back of the Double cutters gives it a greater tendency to bend the cutters than that of the cutters of the Wilson. This frequently causes breakage of the Double cutters.

Q. 790. Your answers to Questions 310 to 315, inclusive, in disagreement with Mr. E. C. Wilson's testimony, that the extension of the spreading-bearings and thrust-bearings in "Complainants' Exhibit Double Underreamer," transfers the fulcrum from the point of contact further down on the cutters, is summed up in a denial of Mr. Wilson's testimony. Will you please state your reasons for this disagreement with his testimony as to the shifting of this fulcrum point?

Mr. LYON.—I submit to this witness the transcript of the record so far as you referred to it.

Mr. BLAKESLEE.—Here are the questions right here.

A. This fulcrum has not been shifted. It is in the same position in the alleged old type and in the new type.

(Testimony of Thomas J. Griffin.)

Q. 791. In the new type of Double underreamer cutters, is not the fulcrum at the shoulders on the inner faces of the cutters in a line transversely of the cutters and extending across the lateral extensions on the cutters?

A. That is a fact; the cutter has been made wider; but that has nothing to do with changing the position of the fulcrum up [535] or down.

Q. 792. Well, isn't the fulcrum in the improved cutter at this widened portion of the cutter?

A. Yes.

Q. 793. And that widened portion of the cutter is at the lower portion of the inwardly projecting shoulders, is it not?

A. It has nothing in common to do with the V-shaped shoulders. The point of fulcrum has not been changed at all.

Q. 794. I will ask that the question be read, that the witness may again have an opportunity to answer it. (Last question read.) A. Yes.

Q. 795. And the corresponding fulcrum point, or fulcrum area, upon the hollow-slotted extension at the lower end thereof, is arranged in the main further down below the dovetails than it was in "Defendant's Exhibit Double Underreamer"?

A. No, it has not been changed. There has been or is cut away a portion of the upwardly and inwardly inclined dovetail ways a V-shaped notch, which has not changed the fulcrum. Read that question. (Last question read.) If any at all, not more than one-sixteenth of an inch difference.

(Testimony of Thomas J. Griffin.)

Q. 796. Then the inwardly inclined spreading-surfaces at the lower end of the hollow-slotted extension of the Double underreamer are further below the lower ends of the dovetails on the body than they were in the original Double underreamer like "Defendant's Exhibit Double Underreamer"; is that not so?

A. No. Not more than one-sixteenth of an inch, if any at all. I desire to change that answer just the least bit, modify it. Owing to the size and type of the different reamers there may be a small variation, and such might be the case in other sizes. [536] When I made my answer I had reference to the 4 $\frac{1}{2}$ inch improved Double underreamer.

Q. 797. Then, in a 10-inch Double underreamer, approximately how much change would there be?

A. I could not say, as I never put the instrument on it to test it.

Q. 798. It would be more than a sixteenth, would it not?

A. I don't know. I don't know whether it would be one way or the other; it might be more; it might be less.

Q. 799. So when you testified you did not agree with Mr. Wilson; you were merely guessing at the condition; is that it? A. No, I have not guessed.

Q. 800. You simply did not know; is that it?

A. I only stated facts.

Q. 801. Which are not in accordance with the facts that you have just demonstrated, I take it?

A. Which are facts as regards the 4 $\frac{1}{2}$ inch Double

(Testimony of Thomas J. Griffin.)

underreamer which you had reference to; and I simply made this modification, that there was another style and size of reamer in front of me which you had no reference to when you asked the question.

Q. 806. In the old style Double cutters there was nothing extending beyond the sides of the shanks of the cutters to prevent such rotary movement with the exception of the dovetails; is that not so?

A. Why, I think you are correct, as the dovetail was the limit of the bearing on the inner faces of the cutters.

In "Complainants' Exhibit Double Underreamer With a Large Slot," I did not remove the slot; however, I did remove all the hollow. The hollow-slotted extension is still there.

It would be impossible to obtain expansion or contraction of the cutters in "Complainant's Exhibit Double Underreamer With Enlarged Slot" if the spreading-surfaces at the bottom of the [537] body were all removed.

With the "Defendant's Exhibit Double Underreamer" and with "Complainant's Exhibit Double Underreamer With Enlarged Slot" should the spreading portion of the surfaces of the lower end of the body be removed such reamers would be entirely inoperative.

Q. 816. I will now ask you if it would be possible to obtain any expansion or contraction of the cutters in "Complainants' Exhibit Double Underreamer With Enlarged Slot" if the spreading surfaces at the bottom of the body were removed?

(Testimony of Thomas J. Griffin.)

A. No. If you would remove them you could not get any expansion.

Q. 817. And if you removed those spreading surfaces there, you would still have spaced projections at the lower end of the body?

A. No more so in the Double than you would in the Wilson. When you increase the size of the hollow slotted extension in either one, you have destroyed the bearings thereon.

Q. 818. I will now again ask you if you would still not have spaced projections at the bottom of the body of "Complainants' Exhibit Double Underreamer With Enlarged Slot," if you removed those portions of the body at the lower end over which the cutters and the shoulders thereof tilt in expanding and contracting and only those portions?

A. It would have no tilting or expansion effect, as the thinner you get the body of the reamer, the less bearing you would have. Identically the same with the Wilson.

Q. 819. I will give the witness another chance to answer this question, and ask that it be read to him. (The question is read.) A. Yes, sir.

Q. 820. And with those portions of the body so removed, would [538] it be possible to use a cutter like that in "Defendant's Exhibit Double Underreamer" with this "Complainants' Exhibit Double Underreamer With Enlarged Slot"?

A. No; nor no other kind of cutter that could be put on it—such as would go in a well.

Q. 821. In other words, with these spreading por-

(Testimony of Thomas J. Griffin.)

tions of the surfaces of the lower end of the body removed, the reamer as an entirety would be inoperative, would it not?

A. Yes; or any other reamer built upon those lines, and, especially, the Wilson—"Complainants' Exhibit Wilson Reamer No. 2."

Mr. BLAKESLEE.—I will ask that all that latter portion of the answer which commences with "and especially" be stricken out as not responsive to the question.

Q. 822. Now, will you please point out to me in either "Complainants' Exhibit Wilson Underreamer or "Complainants' Exhibit Wilson Underreamer No. 2" where there is any spreading portion or surface at the lower end of the body inward of the inner faces of the spaced projections or prongs with which the cutters coact in tilting?

A. There is none.

Q. 828. What functions would these widened thrust-bearings at the lower end of the body have without widening the cutters to work on them?

A. None.

With "Complainants' Exhibit Double Underreamer With Enlarged Slot," the hollow and the slot are still there. With a small-sized bolt across the lower end there is some of the hollow and some of the slot below the bolt and some of the hollow and some of the slot above the bolt. But if we use the larger bolt that would not be the case. [539]

With the cutters of "Complainants' Exhibit Double Underreamer" all the expanding surfaces

(Testimony of Thomas J. Griffin.)

of the cutters are between the outer edges of the dovetails where with the Wilson the spreading surfaces are arranged laterally of the shanks of the cutters, or outside of the shank of the cutters.

The dovetails of the Wilson underreamer body have more metal in them than is in the Double underreamer. The dovetails of the Wilson underreamer body are stronger than those of the Double underreamer, having more metal and being thicker at their lower portion. But, owing to the construction, the Wilson dovetails will break off as quick, if not quicker, than the Double owing to their peculiar construction. The big unbroken single chamber or space between the prongs of the lower end of the Wilson underreamer body is to be considered as to part of it a slot and as to part of it a hollow.

In regard to my testimony concerning the Kibele reamers or Wilson underreamers belonging to Mr. Jack Kibele which I saw at The Bakersfield Iron Works will say that I was told by the superintendent of the shops and also by himself that all of his reamers were at the Bakersfield Iron Works, hence I testified that all his reamers had had the safety bolt put in them.

I do not know whether these reamers had been remachined or not.

I testified that the Salt Lake Oil Company were using only Double reamers. I did not search through the fields to obtain that information, I simply searched the company's tool rack.

Q. 921. Then you don't know really that they are

(Testimony of Thomas J. Griffin.)

exclusively using the Double underreamer in the so-called Salt Lake field west of the city of Los Angeles?

A. Only what I have been told and what wells I saw in operation. What I have observed while out there on the Salt Lake Company's property, on what I think is known as the [540] Wolfskill Ranch. I saw the Double reamer being used there.

Mr. BLAKESLEE.—In view of the witness' last answer we will ask that his answers to questions 431 and 432 be stricken from the record as being based merely upon hearsay.

Q. 946. Referring to "Complainants' Exhibit Double Patent," I will ask you to point out the parts therein referred to as the hollow slotted extension.

Mr. LYON.—Objected to as not cross-examination, the witness not having been examined with reference to "Complainants' Exhibit Double Patent," the patent in suit; but having been examined solely as a practical expert with relation to the Double underreamers and "Complainants' Exhibit Double Underreamer" and "Defendant's Exhibit Double Underreamer" as they stand.

Mr. BLAKESLEE.—I must call counsel's attention to question 398, and in view of that question I submit that the last question put to this witness is a proper question in cross-examination.

A. In view of the question asked, and my statement before that I had not qualified to examine and pass upon the validity of the Double patent in suit, unless counsel for complainants so requests, I shall

(Testimony of Thomas J. Griffin.)

have to decline to answer the question.

Mr. LYON.—The question is further objected to as not the best evidence; the patent speaks for itself. But the witness is requested to take such time as he desires, and if counsel for defendant insists, examine carefully the drawings of such exhibit [541] and also the description and claims, if counsel for defendant so insists, and answer the question as to his interpretation of the descriptive matter and drawings of said exhibit. He will, however, confine his answers to the descriptive matter and drawings.

Mr. BLAKESLEE.—I will have to ask the witness further if he has not examined this patent as one of the exhibits in this case.

The WITNESS.—I have read over this application, or this patent, once, that is to say, the specifications and probably two or three of the claims.

Mr. BLAKESLEE.—There is no objection to the witness giving such time as he wishes to examine this patent. I am not questioning him as to any matter touching upon its validity, merely as to the plain disclosure of the patent, specification and drawing.

Mr. LYON.—Inasmuch as we have not examined this witness as to any interpretation of the descriptive matter of the Double patent in suit, the exhibit referred to by counsel for the defendant, we insist that the inquiry is not cross-examination, that he is, by pursuing this line of inquiry, making the witness his own, and must be bound by his testimony. If the testimony is in any manner competent, such objection will be understood, as having been taken to

(Testimony of Thomas J. Griffin.)

any other questions addressed to this witness in regard to the meaning or interpretation of the descriptive portion of said exhibit without the necessity of hereinafter repeating the same.

Mr. BLAKESLEE.—We stand upon questions 398 and 399 put to this witness as a proper foundation for the last question, and submit that if the witness was qualified to answer as to the relations of the bits in collapsed position, he is equally qualified [542] to testify as to other parts of the disclosure of this patent. Counsel has certainly opened the door for this inquiry in putting these questions.

A. Now, read that question. (Question No. 946 read.) In Figure IX, in patent No. 734,833, I find by referring to Number 8 on the lower portion of the hollow mandrel or body, commencing at figure 8, and projecting downward to its lower portion, constitutes a portion of the slot. And beginning just below the portion designated as Number 8 I find the slot projecting through that portion of the hollow continues downwardly to any desired length that the mechanic may desire to make it, forming a hollow slotted extension; so that it has an abutment to prevent the rod key or T and cutters from being pulled down and out of the body. In other words, a retaining wall preventing such action. I find that this is hollow throughout its entire length. I find that the slot continues from one periphery to the other, and from one periphery to the central portion of the body into the hollow and the hollow continues to the lower portion of the mandrel, certainly forming a

(Testimony of Thomas J. Griffin.)

hollow slotted extension, beginning at the shoulder, 8, and continuing the full length of that portion of the mandrel.

Q. 947. I note in the specification of the Double patent in suit that the numeral "6" refers to what is called "a downward extension"; and that the numeral "7" refers to what is called a "key-way" in such downward extension. Do you find in this specification any other reference, than by means of the numeral "6," to an extension?

A. I will say that I do not; further that I do not know why the term "key-way" was mentioned in this particular paragraph of the specification, as it is not a key-way; and so cannot be [543] construed by mechanics.

Q. 948. I note further that the specifications state, "17 designates a key in the key seats of the slips and rod and playing in the key-way 7 of said extension." In what way do you take it this key plays in this key-way of the extension?

A. The key-way is there for the purpose of forming a guide, as it is called in this paragraph. For what purpose I don't know, as it is clearly not a key-way, mechanically speaking.

Q. 949. Then, what would you call this opening, 7, referred to as a key-way in the Double patent?

A. A hollow slotted extension, as it is hollow, unquestionably; and it is slotted.

Q. 950. Is there any key in "Complainants' Exhibit Wilson Underreamer" or "Complainants' Exhibit Wilson Underreamer No. 2" which connects

(Testimony of Thomas J. Griffin.)

the cutters with the spring-actuated rod?

A. In "Complainants' Exhibit Wilson Underreamer" there is not. In "Complainants' Exhibit Wilson Underreamer No. 2" there is.

Q. 951. Do I understand you that in "Complainants' Exhibit Wilson Underreamer No. 2," there is a key that connects the cutters with the spring-actuated rod? A. Yes.

Q. 952. Please describe it to me as to its location and connection with the other parts.

A. It is a key-way cut in the body just above the thrust-bearing going through the hollow of the mandrel, passing through a slotted mandrel; and the mandrel, in turn, is made at its lower portion with a crosswise enlargement key or T that the cutters are suspended on. The key that I have reference to works directly in conjunction with the cutters.

Q. 953. Does the key referred to in "Complainants' Exhibit [544] Wilson Underreamer No. 2" at any point touch the cutters in that exhibit?

A. No, they do not touch them.

Q. 956. Now, I note the specification of the Double patent in suit states that the shoulders, 8, are at the sides of such extension, namely, the extension, 6, and that the upwardly and inwardly sloping tapering dovetail slipways, 9, are beneath said shoulders. Will you please point out to me in the specification of the Double patent in suit wherein any reference is made to the connection of these tapering dovetail slipways, 9, with the extension 6?

A. I do not think that the specifications of the pat-

(Testimony of Thomas J. Griffin.)

ent specifically specifies that in those words that you desire, but unquestionably it does.

Q. 957. Unquestionably what does? Please explain that statement.

A. Connect one with the other.

Q. 958. What connects with what?

A. Read the question, Mr. Examiner. (Question No. 956 read.) A portion of the upwardly-inclined dovetails is part of the body; and it, in turn, is a portion of the part of the body which is designated by the figure 6, through which passes the hollow.

Q. 959. And these upwardly-inwardly inclined tapering dovetails, 9, lie in planes which extend at right angles to the opposite flat parallel faces of the extension, 6, do they not? A. They do. [545]

In comparing the "Complainant's Exhibit Double Underreamer" with "Defendant's Exhibit Wilson Underreamer" there appears to be several minor differences which is apparent. When I speak of the projection at the backs of the Wilson reamer cutters which coact with the spreading bearings on the ends of the prongs of the Wilson underreamer, I do not wish to be understood as testifying that any of these spreading surfaces of the cutter project inwardly beyond the inner faces of the cutters. Those projections lie on the inner faces of the cutters, however. However, they do not project inward of the inner faces or the planes of the inner faces of the cutters.

Q. 991. Then, there is no such inward projecting portion of the cutters on the Wilson reamers, is

(Testimony of Thomas J. Griffin.)

there, that is, a portion projecting inward of the faces which can serve as fulcrum points as do the inwardly projecting shoulders on the cutters of the Double reamer?

A. There is no inward projecting shoulders on the Double cutter, no more than there is in the Wilson, but the expanding shoulders are there in the Wilson for substantially the same purpose one with the other.

Q. 992. In the Double reamer cutters, the inner faces are pocketed out, are they not, to produce abrupt shoulders which engage with the spreading-surfaces at the lower portion of the body?

A. The shanks of the cutters have V-shaped notches cut across their inner faces forming a shoulder.

Q. 993. And these shoulders act as I stated in my last question, do they not? A. They do.

Q. 994. Are there any such notches forming any such shoulders in the shanks of the cutters of the Wilson reamer cutters? [546]

A. Yes, but they do not go clear across the inner face of the cutter.

Q. 995. Then, there are no such shoulders formed in the inner faces of the shanks of the cutters of the Wilson underreamer acting as fulcrum points in the swinging action of the cutters, are there?

A. Yes.

Q. 996. In the inner faces of the shanks?

A. On the inner faces of the shank—just excuse me—read that question. (Last question read.) No.

(Testimony of Thomas J. Griffin.)

A fulcrum is a point over which pressure can be exerted, causing a teetering or tilting action and the key that you have referred to, namely, the key to which the Double reamer cutters are suspended, have nothing to do with this fulcrum, and is not a fulcrum. It is simply means for suspension of the cutters allowing them to move upwardly and downwardly in their places.

Q. 1000. In your visit to the property of the Murphey Oil Company of Whittier taken, you say, soon after Mr. Schinneller testified for defendant, did you visit each and every well on that property?

A. No, sir, I don't know where each and every well is located.

Q. 1001. In your answer to question 421 you stated, "I found they were using all Double underreamers." How did you find this out?

A. By asking questions.

Q. 1002. And your information, then, as to the use of the Double reamer on that property simply came from responses you got to questions? A. No.

Q. 1003. How else?

A. I sat here in this office and heard—or in Mr. Raymond I. Blakeslee's office, rather, and heard Mr. Schinneller's [547] testimony that they were using all Double underreamers with the exception of one 4½-inch Plotts reamer, and that they were using that reamer on their deep well. When I went to their deep well—or their lease, rather—I went to the office and asked one of the men in their office where that deep well was, and he pointed it out to me, and

(Testimony of Thomas J. Griffin.)

I went there and saw a 4½-inch Double reamer pulled out of the hole. And if there has been any mistake made it has been made by Mr. Schinneller.

Q. 1004. You did not attempt, then, to find whether this Plotts underreamer was in use on any other well when you visited this property after Mr. Schinneller testified?

A. I did not. I have never used a North reamer nor never saw a North reamer in use. My testimony as to its inoperativeness is simply my conclusion by examining the drawings and hearing the testimony of the other witnesses. By the word inoperative I do not mean that it would not work at all. No, I don't think the North cutters bear against each other when tilting. Although in answering question #440 I stated that the North reamer to be operative should have a partition between the cutters to take the inner thrust of the cutters I will now say that it would be impossible to place such a partition as that between the cutters. I have never used an underreamer like "Defendant's Exhibit Small Model of Day Device." I have never seen an underreamer used or have never used an underreamer like "Defendant's Exhibit Oil Well Supply Company Limited, 4½" Underreamer." I have never seen an underreamer used or never used a reamer "Defendant's Exhibit O'Donnell & Willard Reamer" or "Defendant's Exhibit O'Donnell & Willard Patent."

There is no hollow slotted extension in the O'Donnell & Willard Defendant's Exhibit, nor is there in

(Testimony of Thomas J. Griffin.)

the O'Donnell & Willard Patent. [548]

Q. 1047. In your answer to question 456 you have testified, "I find that there is no thrust-bearings on the shanks of the O'Donnell & Willard Underreamer." Do you wish that answer to stand with relation to the O'Donnell & Willard patent disclosure?

A. No, I do not, as I have just now explained that same question in my previous answer, as in reply to this particular question quoted I had reference to the reamer exhibit.

Q. 1048. And in the structure of the O'Donnell & Willard patent there are shoulders which take the thrust from the upper ends of the shanks of the cutters, are there not?

A. It shows very small shoulders. At their thickest portion might be an inch, circularly speaking, coming to a feather on their edges.

I have never used or seen used an underreamer like "Defendant's Exhibit Kellerman Patent."

Q. 1053. Do not the ways in the Swan underreamer, as shown in "Defendant's Exhibit Sample of Swan Underreamer," and "Defendant's Exhibit Swan Patent," serve to keep the cutters from being displaced sidewise in the same manner as the dovetails in the Double underreamer and in the Wilson underreamer? A. Yes.

Q. 1054. And is there not a hollow slotted extension in the Swan underreamer and also shown in the Swan patent?

A. If you want to term them that, yes. I do not.

(Testimony of Thomas J. Griffin.)

Q. 1055. This part is an extension of the main body, is it not? A. Yes.

Q. 1056. The cutters are mounted to move at either side of the extension of the body, are they not?

A. Yes.

Q. 1057. There is a hollow in this extension through which [549] the spring-actuated rod plays, is there not? A. Partially.

Q. 1058. There is a transverse slot through this extension? A. Yes.

Q. 1059. Through which the T that carries the cutters at the lower end of the rod plays, is there not?

A. There is no T disclosed in this invention.

Q. 1060. What is there in place of the T?

A. A key.

Q. 1061. Well, then, is there not a slot through which this key plays?

A. Yes, but there is no hollow slotted extension, as the hollow does not go through the reamer; therefore, you cannot term it as a hollow.

Q. 1062. There is a hollow in this extension, is there not?

A. There is a hollow in part of the extension.

Q. 1063. Well, let us refer to the exhibits. Is not there a chamber in the body of the Swan under-reamer running lengthwise of the body?

A. There is a partial chamber.

Q. 1064. And does not that chamber run down into the slotted extension? A. Yes.

Q. 1065. And does not the slot in the extension run

(Testimony of Thomas J. Griffin.)

transversely through the extension and through this hollow? A. Yes.

Q. 1066. And don't the cutters expand as they move upwardly on this extension?

A. It does, but they do not tilt. They move upward and outward, sliding upon a key.

Q. 1067. I understand you to draw a distinction between an [550] extension on the lower end of the reamer, such as the Double reamer, in which the hollow runs clear to the bottom of the extension, and an extension such as that of the Swan patent and Swan reamer in which the hollow stops a little above the lower end of the extension. Does that make a difference, in your opinion, or within your definition with relation to whether one is a hollow extension and the other is not?

A. It matters not whether it is my opinion or not. The fact remains that this is not a hollow, as you can pass nothing from the upper end through to the lower end. The facts remain the same.

Q. 1068. Then, if there were a hollow between the prongs of the Wilson underreamer and you put a retaining-bolt across it, would not that kill this space as far as its consideration of being a hollow is concerned? A. That is what I have testified to.

The Swan underreamer has what you might call dovetailed retaining ways; yes. In comparing "Defendant's Exhibit O'Donnell & Willard Patent," and "Complainant's Exhibit Double Underreamer Patent" I don't find any difference in the working fits in the spring-actuated rods in the hollows which ac-

(Testimony of Thomas J. Griffin.)

commodate them in their movements in their lower ends.

The slot in the partition in the O'Donnell & Willard reamer and in the O'Donnell & Willard patent runs transversely through the partition crossing this hollow in the partition of the inside, but not extending into the body as in the Double. There is no slot in the body of the O'Donnell & Willard patent, there is no hollow in the partition of the O'Donnell & Willard patent. There is a slot in the partition vertically. If we remove the partition from the O'Donnell & Willard patent the cutters would still expand and contract. [551]

If the inner surfaces of the inner bits or cutters of the O'Donnell & Willard reamer engage with the lower end of the partition, and the bits or cutters are moved upwardly, there is nothing to prevent the partition from causing the lower end of the cutters to expand.

Q. 1114. And if the inner surfaces of the bits or cutters engage with the lower end of the partition, and the bits or cutters are moved upwardly, what is to prevent the partition from causing the lower ends of the cutters to expand?

A. There is nothing to prevent it from expanding.

Q. 1115. That being the case what difference is there between the action of the partition upon the cutters in the expanding of the cutters in the O'Donnell & Willard reamer, at the lower end portion of the partition, and the action of the lower end por-

(Testimony of Thomas J. Griffin.)

tion of the hollow-slotted extension, upon the cutters of the Double reamer?

A. There is no comparison in these two. The action of one does not pertain to the action of the other.

Q. 1116. Point out wherein there is any dissimilarity in the action under these circumstances.

A. Why, there is no tilting action there. It does not come up over a wedge-shaped partition. The inner surfaces of these cutters are parallel. There is no such action in this cutter that there is in the Double; simply a wedge.

Q. 1117. There is nothing to prevent the cutters in the O'Donnell & Willard from tilting in around the lower end of the partition, is there? A. Yes.

Q. 1118. And what?

A. The partition. There is no grooves for this end of the partition to drop into, allowing them to tilt, or to come [552] into such position as I can see. The inner surfaces of the cutters are parallel; so is the partitions outer surfaces parallel.

Q. 1119. You say the outer opposite faces of the partition are parallel?

A. No, I did not say anything about the opposite faces.

Q. 1120. What faces of the partition are parallel?

A. The faces of the partition—the faces on the partition is parallel to the faces of the cutters.

Q. 1121. And the lower end of the partition has its faces rounded or inclined in toward each other, has it not?

A. It has, for the purpose of allowing this tilt-

(Testimony of Thomas J. Griffin.)

ing action, but this is not a titling action. It is a sliding action on the key that brings them in together.

Q. 1122. Yet they tilt around this intermediate partition, do they not?

A. Well, you might term it that.

Q. 1131. And there is a partition between these cutters in the O'Donnell & Willard patent which you do not find between the cutters in the North patent; is that correct? A. Yes.

Mr. BLAKESLEE.—I will ask the witness to please prepare and submit at the next session of taking testimony in this case, or as soon thereafter as he can before the closing of these proceedings, a pen and ink drawing showing the lower portion of the Wilson underreamer. And he may take either "Complainants' Exhibit Wilson Reamer" or "Complainants' Exhibit Wilson Underreamer No. 2" as a guide, with the cutters removed, and with the retaining bolt removed and with the T up as far as it goes in the working of the Wilson underreamer. And indicate on that drawing in black ink such slot as he finds [553] present in the Wilson underreamer at the lower end thereof; and in red ink such hollow as he finds present in the Wilson underreamer at the lower end thereof. And I will ask that this drawing be marked as "Defendant's Exhibit Griffin's Sketch of Part of Wilson Underreamer Illustrating the Alleged Slot and Hollow there Present."

Mr. LYON.—Objected to as incompetent; no foundation laid; and the witness not having quali-

(Testimony of Thomas J. Griffin.)

fied to answer the question, the witness never having testified that he was skilled as a draftsman, or capable himself of making any such drawing as demanded by counsel. And upon the further ground that it is not a proper proceeding nor a proper request.

Mr. BLAKESLEE.—In response we will say, not in argument, but merely as a suggestion, that the witness may have the assistance of such draftsmen as he will choose, to whom he may give his instructions in preparing this sketch.

The WITNESS.—Now, I wish to say that I am not a draftsman; having never testified that I was a draftsman; never having qualified as a draftsman; and that I cannot make any drawings hardly intelligible to myself; and that if counsel for defendants will designate a draftsman, and will pay those expenses which I decline to do out of my own pocket, I will stand over him while he makes those drawings and will show him what I want; otherwise, not being a man of means, I shall have to decline to produce this drawing at my expense.

Mr. BLAKESLEE.—The request still stands without any condition or modification.

Mr. LYON.—Is that the conclusion of the cross-examination?

Mr. BLAKESLEE.—Yes.

When the cutters of the “Defendant’s Exhibit O’Donnell [554] and Willard Underreamer” and “Defendant’s Exhibit of the O’Donnell and Willard Patent No. 762,435” are in the act of expanding or

(Testimony of Thomas J. Griffin.)

contracting there is no portion of those cutters which contracts with the partition or the removable wedge-shaped partition 3. In that respect the O'Donnell & Willard differs from the Double or the Wilson reamer.

The tapering surfaces or the lugs or projections at the ends of the prongs of the Wilson underreamer body are for the purpose of allowing the cutters to collapse on their initial downward movement. It is also for the purpose of providing inward thrust bearings. These bearings accomplish the same purpose as the upwardly and inwardly inclined dovetails of the Double reamer.

Recross-examination.

(By Mr. BLAKESLEE.)

Q. 1148. You have testified that the upwardly and inwardly inclined dovetails of the Double underreamer only assist in the expanding action of the cutters under certain working conditions but not under all working conditions, I believe; is that not correct?

A. No, sir; I have never testified that the upwardly and inwardly inclined dovetails on the Double reamer assist in the expansion or contraction of the bits. I have testified that the upwardly and inwardly inclined dovetails were there for the purpose of allowing the additional contraction of the bits when they were in pinched form and were there otherwise simply as guides.

Q. 1149. Guides for what?

(Testimony of Thomas J. Griffin.)

A. For the protection or for the prevention of the bits from falling out.

Q. 1150. And acting as such guides, the upper ends of the cutters come in contact with these dovetails, do they not?

A. Not only their upper ends but their lower, also come in contact. [555]

Q. 1151. And if their upper ends are in contact when the cutters are expanding, does it not follow that these upwardly and inwardly inclined dovetails assist in the spreading action of the cutters?

A. If that underreamer is being expanded or contracted through a shoe, the dovetails of the bits never come in contact with the outward or inward sides of the dovetail as it is bound and pressed against the central portion of the body, and it never comes in contact with them until it arrives at its full expansion.

Q. 1152. All right. That is why I tried to carefully draw a distinction for you in construing your previous testimony between those working conditions when the shoe is coacting with the cutters and other working conditions when it is not. Now, in the contraction and expansion of the cutters under other circumstances, as, for instance, when the cutters are beneath the shoe, and the upper ends of the cutters are guided by these upwardly and inwardly inclined dovetails on the body, such contact will assist in the contraction or expansion of the cutters, will it not?

A. It will not unless it is pinched at the bottom

(Testimony of Thomas J. Griffin.)

of the cutting edges of the bits. Then when such is the case, as I have previously testified and defined, both the action of the cutters when working under normal conditions and also when working under abnormal conditions, such as being pinched at their lower ends, and if they were working below the casing in a pinchingly formation, as the ends of the cutters dubbed off and making the hole smaller, gradually smaller, then it would necessarily bind or hold the cutters slightly, causing them to collapse or come down towards the bottom of the reamer, thereby allowing a slight tilting action on the fulcrum point of the spreading bearings, freeing themselves from such a pinched condition. [556]

Q. 1153. And do not the upwardly and inwardly inclined dovetails on the body in the Double reamer actually assist in tilting the cutters when the upper ends of the dovetails of the cutters are under these or other circumstances in contact therewith?

A. In expanding or contracting?

Q. 1154. In either.

A. In the pinched form they simply act as preventers for the cutters, not allowing their upper ends to swing outward, and are there as guides guiding the upper end of the cutter back into its normal position, substantially the same as the slightly beveled portion of the Wilson underreamer, either of their exhibits; simply a matter of angles being inverted or reversed.

Q. 1155. Now, do these dovetails on the body of the Double reamer act as guides, within the mean-

(Testimony of Thomas J. Griffin.)

ing of your last answer, during the movements of the cutters?

A. I will have to ask in what condition, normally expanded and contracted or contracted by being pinched?

Q. 1156. Under any conditions, and you may define them if you wish.

A. As I have stated before—answered that question I don't know how many different times and I have defined it a great many times heretofore; having distinguished the two actions as separate and distinct one from the other, I shall say that the upwardly and inwardly inclined dovetails on the Double reamer when being contracted in a pinched formation, that the upwardly and inwardly inclined dovetails are for the purpose of preventing and in allowing additional space that the cutter may have a slight tilting action on the fulcrum of the body, and that when being contracted and expanded in normal condition there is no engagement of this upwardly and inwardly inclined dovetail until such cutter has arrived at its upward and full movement. [557]

Q. 1157. Now, leave the normal conditions, as you have referred to them, out of consideration, and answer the previous question with respect to any such conditions as you except from the definition of normal.

A. Well, I will have to repeat what I said in my previous answer, that when the cutters are pinched at their lower points they pull down slightly, and at that point they have a slight tendency to slide on

(Testimony of Thomas J. Griffin.)

the key, giving the cutter a tilting movement over the fulcrum of the body; and that they come in contact with the inner surfaces of the upwardly and inwardly inclined dovetails with the surface of the outer dovetail on the cutter, and the play there thus caused by the taper of the upwardly and inwardly inclined dovetail is identically for and is a part of the bottom of the Wilson underreamer, and for the same purpose, and answers the same purpose; and that upwardly and inwardly inclined dovetail has nothing to do with the expansion or contraction of the Double underreamer under any condition. It is there simply as a guide for the upper portion of the cutter.

Q. 1158. I shall have to ask you again whether or not under those conditions which you seem to consider abnormal in the use of the Double underreamer, the upper ends of the dovetails on the cutters of the Double underreamer are not in engagement with the upwardly and inwardly inclined dovetails on the body during part of the movement of the cutters either in collapsion or expansion; and I wish you to answer this question yes or no, and then without referring to the Wilson reamer or any other, make any further statement which you wish to in answer to the question.

A. I do not believe it is in me, or anyone else, to answer counsel's question as he desires. I have stated that the upper ends of the Double cutters come in contact with the upwardly and inwardly inclined dovetails in expansion and contraction under

(Testimony of Thomas J. Griffin.)

[558] abnormal condition, and I cannot express it in my humble English language any plainer than I have said. And I shall now have to ask counsel not to continue on that line of cross-examination, as I have answered and endeavored to answer this question as fairly as a man can. And this action that I speak of, or these parts that I speak of, have nothing whatever to do with the expansion or contraction of the Double underreamer. They are there for the guidance or guides of the upper ends of the cutters.

Q. 1159. Is that all the answer which you can give or will give to this question?

A. It is not a question of will give. I will give any answer that lays in my capacity, and is correct, the truth, nothing but the truth, and facts, as disclosed in the invention; and I have no other way of differentiating, or answering the question so as to differentiate the answer to the question satisfactorily to counsel.

Q. 1160. I will ask again if that is all you have to say in response to that question. If that is so, we will drop the matter right there.

A. I have said yes.

When the Wilson underreamer is normally operated, there is a spreading or expansion or contraction of the Wilson cutters when they ride over the spreading surfaces upon which the cutters rest when in an expanded position. But when the Double reamer is normally operated the upwardly inclined dovetails on the body do not cause any part of the collapsing

(Testimony of Thomas J. Griffin.)

or expanding action of the Double reamer cutters.

When I speak of the lower end of the partition 3, of the O'Donnell & Willard patent I mean the lower end or the rounded portion.

I don't believe I could say whether the cutters of the O'Donnell & Willard reamer, when they are collapsing and come out of contact with the flat faces of the partition and move [559] down to the rounded end or bear against the rounded end of the partition and in so moving I don't know whether the reamer cutters tilt or not. True, in cut, figure 1, of the O'Donnell & Willard patent it is shown that the upper end of the cutters are tilted or slid outwardly on the key; but I cannot see any tilting action that could have taken place on the T-rod.

It is true that the drawing in the O'Donnell & Willard patent, figure 1, shows that the lower ends of the O'Donnell & Willard cutters have tilted in, and the upper ends of those cutters show that they have slid out on the key.

The action of the O'Donnell & Willard cutter coming in contact with the shoes is at all times below the end of the body, giving the cutters a sliding effect on the key and a slight teetering effect on the removable wedge-shaped partition. This is not the case in the Wilson or the Double, as the casing comes in contact with the shoulder just below the upper end of the shank. There is no surface over which the cutter of the O'Donnell & Willard underreamer ride when expanding or contracting.

Q. 1243. (By Mr. BLAKESLEE.) Now, ad-

(Testimony of Thomas J. Griffin.)

mitting that the partition of the O'Donnell & Willard reamer is a removable part, it is nevertheless an extension or extended part of the reamer down to the bowl and to a point beneath the bowl, is it not?

A. In the same mechanical sense as the Wilson.

Q. 1244. I will have to ask the witness to answer the question Yes or No without any comparison with any other reamer.

A. Read the question. (Question No. 1243 read).
Yes.

Q. 1245. Now, there is a slot running through this extension, through and within which the T, which suspends the cutters, moves, is there not?

A. There is an elongated slot that goes from one flat surface to the other in this removable partition.
[560]

**Testimony of James W. Kelley, Witness Called on
Behalf of Complainants.**

Mr. Kelly deposes and states:

My name is James W. Kelley; that I reside in Victoria, British Columbia, and am a well driller, connected with the Northwestern Company Limited, operating in Alberta, Canada. Have drilled in Ontario and Quebec. Had no use for underreamers in Ontario and Quebec. Wells there are from 2,000 to 3,000 feet in depth. In Alberta the depth of the wells is from 1,800 to 2,200 feet. We used Double reamers in Alberta. Most of our reamers come from the Chicago Works of the Union Tool Company. Mr. Double, I believe, is President of that Company. I know of no other reamers used in

(Testimony of James W. Kelley.)

Canada except the Swan. I have never seen a tool like that shown by "Defendant's Exhibit Oil Well Supply Company's of Canada 41½" Reamer." Have been operating there for five years. We use altogether American made tools. We use cable tools.

In Columbia, South America, we used down there the Swan reamer and the Austrian reamer and the Double reamer. We are now using the Double reamer exclusively. We had trouble in losing the cutters of the Swan underreamer. The Austrian reamer did not drop, that is it did not run free in the hole. I have been around the rigs or wells of the other companies a great deal but I have never seen a reamer like the Canadian underreamer. My opinion of the Canadian underreamer as shown by "Defendant's Exhibit Oil Well Supply Company's Limited on Canada's 41½ Underreamer," is that the cutters are too long and not properly supported. I would not use such a reamer. Our operations in Ontario are probably 150 miles away from Petrolia, Canada. I have been drilling in Canada only during the last five years. My experience in Canada does not go back in 1907. I never used a Wilson underreamer. We did some actual underreaming with the Swan reamers and the Austrian reamers.

[561]

While the Swan reamer and the Austrian reamer were not so successful as the Double still each of them did underream. One trouble with the Austrian and Swan reamers was the breakage of cutters, never lost or broke a Double cutter.

(Testimony of James W. Kelley.)

My operation in Ontario and in Columbia, South America was that of an overseer. I get reports of the work done. I have been on the ground a great deal of the time, myself. I am not sure that I could say I used the Swan underreamer earlier than about three or four years ago. I used the Austrian underreamer about that time. From that on for a couple of years.

Q. 67. Why do you prefer the Double underreamer?

A. Well, we get very satisfactory results with it. It sets perfectly, and trips perfectly; and when it is expanded it is firm and solid; and if the cutters are properly dressed, drops free.

Q. 68. What has the proper dressing of the cutters to do with the underreaming?

A. If the cutters are not properly dressed they will drag in the hole.

Q. 69. How did you come to secure your first Double underreamers?

A. In drilling in Alberta, which was done by the Canadian Pacific, one of my business associates, Mr. Eugene Coste, was the engineer in charge of the work; and he first told me they were having much better success with the Double underreamers than they were with the underreamers which they were using before, which, I think, was the Swan. They had no trouble losing cutters, and they were getting their work along much better, and in my operating in South America, when I first took charge of the [562] operations there, there was an outfit on the

(Testimony of James W. Kelley.)

ground which had been sent in—furnished, I think, by the Oil Well Supply Company. In that outfit there was a Swan and Austrian underreamer. We started up first with the outfit that was on the ground and drilled one shallow well; had considerable trouble; and had been having more or less trouble handling pipe and underreaming and I then began to order exclusively Union Tool Company tools and using exclusively their underreamers. [563]

**Testimony of Arthur P. Knight, Witness on Behalf
of Complainants, in Rebuttal.**

My name is Arthur P. Knight; age, 48 years; resident of Glendale. Occupation, Patent Attorney and Expert.

A. 2. My mechanical training has been mainly as one of the engineering corps at the works of the General Electric Company, Schenectady, New York; and the Thompson-Houston Electrical Company at Lynn, Massachusetts. In addition to this, however, I have been thrown into connection with mechanical work in the course of my business as a patent attorney for a great many years, and have had occasion to examine machinery and to investigate the mechanical principles involved therein.

In the year 1886 until 1889 I was a member of the Examining Corps of the U. S. Patent Office.

A. 5. My duty was to examine applications for United States letters patent with the view to determining whether they complied with the requirements of the law, and whether the alleged inventions dis-

(Testimony of Arthur P. Knight.)

closed therein were of a patentable nature. In order to determine this point it was necessary for me to compare the inventions submitted with the state of the art as disclosed in the prior patents and publications on file in the patent office. As an Assistant Examiner. I am familiar with mechanical drafting.

A. 7. A necessary qualification is the ability to read patent drawings, which are generally of mechanical structures, although not necessarily drawn to scale. In other words, they are drawings of a mechanism, and in that sense are mechanical drawings, although they do not answer all the requirements of an ordinary mechanical drawing.

I have been called as an expert in quite a number of patent suits.

I have examined the Double underreamer patent #734,833, and am familiar with it. I am also familiar with the Wilson underreamer patent and also "Complainant's Exhibit Wilson Underreamer," [564] and "Complainant's Exhibit Wilson Underreamer No. 2." I am also familiar with the Wilson Patent #827,595, dated July 31, 1906. I am familiar with "Complainant's Exhibit Double Underreamer," and with "Defendant's Exhibit Double Underreamer."

A. 14. The Double patent 734,833 relates to an underreamer, that is to say, to a tool which is adapted to be lowered through a well casing and is provided with cutters which are adapted to expand on passing below the lower end of the casing so as to enable the reaming out of the hole below the casing to a suffi-

(Testimony of Arthur P. Knight.)

cient diameter to allow the casing to descend. On account of the thickness of the casing this hole must be reamed to a diameter larger than the inside of the casing, and in order to enable the casing to perform this function and yet permit the tool to be lowered through the hole, it is necessary to so construct the tool that the cutters may be collapsed or contracted while the tool is being passed down through the casing. The construction disclosed in the patent for this purpose consists of or comprises a hollow body provided with a downward extension, in which are mounted tilt slips, said tilt slips being adapted to move or slip vertically and to tilt; and the downward extension of the body being provided with means for engaging the tilt slips to control their collapsing and expanding movement. Said means consists of shoulders or faces on the tilt slips and on the downward extension which engage in the relative sliding movement of the tilt slips to force the lower ends of the tilt slips outwardly as said tilt slips are raised, these lower ends constituting the cutting portions of the tilt slips. The upward slipping movement of the tilt slips is effected by a spring enclosed in the hollow body and bearing against the shoulder thereon, and operating on the rod, 11, carrying a key indicated at 17, which engages in key seats, 16, in the respective tilt slips. Said key seats being large enough to allow the tilt slips to tilt on the key. Shoulders, 8, are provided [565] at the sides of the downward extension forming thrust-bearings against which the upper ends of the tilt slips engage

(Testimony of Arthur P. Knight.)

when in their uppermost or working positions. Slipways are provided on the downward extension of the hollow body between which the tilt slips slip up and down, these slipways furnishing lateral support for the tilt slips; and being provided with dovetails or flanges, and adapted to engage with corresponding dovetails or flanges on the tilt slips when the tilt slips are in working position, to resist any outward strains on the cutters. Above the spreading-bearings, or shoulder portions, the downward extension is provided with bearing faces described in the patent as "oppositely arranged parallel bearing faces" which are adapted to engage with the tilt slips to resist any inward strains of the cutters. The normal or working position of the parts is shown in Figure 1 of the patent. In this position the tilt slips are at the upper ends of their stroke, the upward movement being arrested by the engagement of the upper ends of the tilt slips with the shoulders, 8, on the body, 1; and the tilt slips being held in this position by the spring, 10, pressing upwardly on the rod, 11, and acting through the key, 17, engaging in key-seats, 16, in the tilt slips to hold the tilt slips upwardly to this position. The bearing portions, or "inward projections," 18, on the cutters which face inwardly or toward the axis of the tool bear against the flat parallel bearing faces on the downward extension and hold the lower ends of the tilt slips outwardly. In this position the dovetails on the slipways engage with the dovetails on the tilt slips so as to limit the outward movement of the tilt slips, and

each tilt slip is therefore firmly held against vertical upward strain which is taken by the shoulder, 18, against inward strain which is taken by the parallel bearing face of the downward extension, against outward strain which is taken by the dovetails, and against lateral strain which is taken by the faces of the slip ways. In this [566] position the cutting edges at the lower ends of the tilt slips are projected to a greater diameter than the body of the tool, and are adapted to ream a hole larger than the casing or the shoe at the lower end of the shoe, as illustrated in Figure 1. When the underreamer is to be withdrawn from the well the tool is pulled upwardly; the slips come in contact at their shouldered portions shown on their outer faces with the bottom of the shoe so that further upward movement of the tilt slips is temporarily arrested, and as the tool continues to be drawn upwardly the parallel bearing faces on the downward extension of the body slide upwardly between the bearing faces, 18, on the tilt slips until the shoulders or spreading-bearings, 25, on the downward extension reach the upper faces or shoulders of the bearings or projections, 18, on the tilt slips; whereupon the inward pressure on the tilt slips due to the engagement of the shoe therewith forces the tilt slips inwardly; the said faces, 26, riding in on the spreading-bearings, 25, until the parts assume the collapsed position shown in Figure 3. In this collapsing action the tilt slips bear, or have a fulcrum, at or near their upper ends on the flat parallel bearing faces; and the pressure of the shoe

(Testimony of Arthur P. Knight.)

is exerted inwardly on the outer faces of the tilt slips somewhat below this fulcrum, but at a considerable distance above the lower or cutting ends of the tilt slips, so that even a limited movement of the portion of the tilt slip which engages the shoe will produce a comparatively large throw of the cutting edges. Moreover, in this collapsing action the tilt slips remain engaged laterally with the slip ways; said slip ways serving as means for holding the tilt slips against lateral movement in collapsing and expanding actions as well as in working position. In order to provide for the lateral support given by these slip ways at each side of the tilt slips, while enabling the outside bearing on the tilt slips by the shoe to be raised as high as possible, so as to give a great inward throw in [567] collapsing, the downward extension is slotted or cut away to allow the outer faces of the tilt slips to project out through the slots between the slip ways so as to be adapted to engage the shoe at a point above the lower ends of the slipways. The bearing of the shoe against the outside of the tilt slips is at a point above the bearing of the bearing face, 18, on the tilt slips with the flat parallel bearing faces on the downward extension of the body so that in the collapsing action by engagement with the shoe, the upper as well as the lower portions of the tilt slips are held inwardly by such pressure of the shoe, and as the tilt slips slide downward relatively to the downward extension and slipways thereon, the dovetails or flanges, 29, on the tilt slips immediately leave the dovetails or flanges on the

(Testimony of Arthur P. Knight.)

slipways. When the underreamer with the tilt slips collapsed as shown in Figure 3 is moved downwardly in the casing so as to pass beneath the shoe, the above described operation is reversed; the spring, 10, which has been compressed in the collapsing operation, tending to draw the tilt slips upwardly and causing the upper faces, 26, on their bearing portions or projections, 18, to ride or slide outwardly on the spreading-bearings, 25, causing the cutting portions of the lower ends of the tilt slips to be expanded outwardly, until said bearing portions or projections, 18, ride onto the flat parallel bearing faces of the downward extension; whereupon the tilt slips move directly upward until their upper ends strike the thrust-bearings or shoulders, 8, and dovetails or flanges, 29, come into contact with the dovetails on the slipways. These dovetails, therefore, do not come into action in the normal and expanding and collapsing operation except when the tilt slips are fully expanded in the position shown in Figure 1. If, however, for any reason, an inward pressure is exerted on the lower ends or cutting edges of the tilt slips, and at the same time the body of the tool is drawn upwardly with respect to the tilt slips, so as to cause the tilt [568] slips to slip downwardly, relative to the downward extension of the body, these dovetails come into operation by reason of a taper or inclination thereof which permits the upper ends of the dovetails or flanges on the tilt slips to swing outwardly to a limited extent, as they slip downwardly into wider portions of the slip ways between the

(Testimony of Arthur P. Knight.)

tapered dovetails. This action, however, cannot occur unless there is an inward pressure on the lower ends of the cutters. This action takes place while the bearing faces or projections, 18, of the tilt slips are in engagement with the flat parallel bearing-faces of the downward extension, and permits the lower ends or cutting portions of the tilt slips to move slightly inward with inward pressure thereon by outward displacement of their upper ends. This action, however, can only take place in case there is an inward pressure on the lower ends of the tilt slips below the bearings of the tilt slips by projections, 18, thereof on the flat parallel bearing faces, and cannot occur in normal collapsing operation by engagement of the shoe, as it is essential to the principle of operation of this patent that the bearing on the shoe should be at a considerable distance above the cutting edges so as to provide for sufficient inward throw in collapsing to effectively clear the cutting edges from the casing. The essential features of the Double underreamer are a hollow body containing the spring and rod for pulling the tilt slips upwardly in normal working position, said rod being provided with a key, and said hollow body being provided with a downward extension in which the tilt slips are slidably and tiltingly mounted, the tilt slips hung on said key on the rod, and the shoulders or bearing faces on the tilt slips and downward extension of the body which cause the lower ends or cutting edges of the tilt slips to be spread outwardly as the tilt slips are moved upwardly by the spring-

(Testimony of Arthur P. Knight.)

actuated rod. A further feature of the reamer shown in this patent is the provision for a thrust-bearing at the upper ends of the tilt slips, an inside bearing [569] at the lower portion of the tilt slips for resisting inward movement of the cutters, side bearings (slip ways) for resisting lateral movement, and outside bearings (dovetails) for resisting outward movement of the cutters, these lower inside bearings being above the spreading-bearings aforesaid on the downward extension, so that in the upward movement of the tilt slips to expanded position they ride onto these inside thrust-bearings after they pass or leave the spreading-bearing. A further feature of the underreamer shown in this patent is the provision for the projection of portions of the tilt slips through slots or spaces between the slip ways on the downward extension of the body, so as to enable the shoe to bear on the tilt slips at a point sufficiently near the fulcrum of said tilt slips at or near their upper ends to give a magnified or enlarged inward throw to the lower cutting edges of the tilt slips, while presenting the lateral and outside thrust-bearings for the tilt slips due to the extension of the downward extension of the body alongside of the tilt slips when in working position. A further feature of the underreamer shown in this patent is the inclination or taper of the dovetails on the tilt slips and downward extension of the body, permitting collapsing movement when, for any reason, an inward pressure is brought upon the lower ends or cutting edges of the tilt slips concurrently with an

(Testimony of Arthur P. Knight.)

upward pull on the tool.

Another feature of the underreamer shown in this patent is the special means provided for facilitating assemblage of the parts by making the key on the spring-actuated rod removable and notching the said key so as to engage with the spring-actuated rod so as to hold the key in position in normal operation.

"Complainants' Exhibit Wilson Reamer" comprises a hollow body having a downward extension provided with slip ways in which tilt slips are mounted to slip vertically and to tilt so as to collapse or expand at their lower ends; said downward extension and [570] said tilt slips being provided with interengaging portions for causing the lower ends of the tilt slips to spread out as the tilt slips slide upwardly. Said tilt slips are drawn upwardly in slip ways by a spring-actuated rod extending within the hollow body, and provided with a cross piece at its lower end serving as a key and engaging in key seats or recesses in the inner faces of the tilt slips, so that the tilt slips are hung or suspended on said spring-actuated rod. In this underreamer the spring which actuates the rod rests on a block which is held in fixed position in the hollow body by screw threaded pins screwed into the sides of the hollow body and projecting into said block. At the upper end of the slip ways the body is formed with thrust-shoulders against which the upper ends of the tilt slips engage when in working position. The lower portion of the said block in the hollow body serves as an inside bearing for the upper end portions of

(Testimony of Arthur P. Knight.)

the tilt slips when in working position. At the lower end of the downward extension are provided the inclined spreading-bearings which engage the shoulders on the tilt slips to expand the tilt slips; and above these spreading-bearings the downward extension is provided with bearing faces which are slightly inclined or downwardly tapered and which engage bearing faces on the tilt slips to form inside thrust-bearings for the tilt slips. The slip ways in this underreamer are formed with dovetails or flanges engaging dovetails or flanges on the tilt slips to form outside bearings for the tilt slips when in expanded working position. The shanks of the tilt slips extend through a slot or space between the dovetails or side walls of the tilt slips so as to be exposed for contact with and operation by the shoe at the bottom of the casing at a point which is above the lower end of the downward extension and of the slip ways.

In this underreamer, therefore, as well as in the underreamer disclosed in patent 734,833, I find an underreamer body [571] which is made hollow to receive a spring-actuated rod, and which is provided at its lower end with a downward extension in which the slip ways are mounted to slip vertically and to tilt inwardly and outwardly, and said tilt slips being hung or suspended on said spring-actuated rod to be drawn upwardly thereby, and said downward extension being provided with spreading-bearings engaging with portions of the tilt slips to expand the tilt slips as they are drawn upwardly.

I also find in this underreamer, as well as the

(Testimony of Arthur P. Knight.)

underreamer disclosed in Patent 734,833, slip ways, in which the tilt slips move and are retained against lateral displacement; thrust-bearings at the upper ends of said slip ways against which the upper ends of the tilt slips engage when in working position; inside thrust-bearings constituted by the slightly inclined or tapering faces directly above the spreading-bearings in this underreamer, "Complainants' Exhibit Wilson Reamer," and constituted by the lower portions of the flat parallel bearing faces on the downward extension in the said patent; and outside bearing faces constituted by the dovetails in the slip ways and on the tilt slips; and an upward inside bearing face constituted by the lower portions of the block within the hollow body in "Complainants' Exhibit Wilson Reamer," and constituted by the upper portions of the flat parallel faces on the downward extension in the patent.

I also find in "Complainants' Exhibit Wilson Underreamer," as well as in the reamer shown in patent 734,833, a hollow body having a downward extension provided with slip ways slotted to permit portions of the tilt slips to project or extend from the slip ways outwardly between the dovetails or sides of the slip ways so as to contact with the shoe at the lower end of the casing and to provide for such contact at a point which is considerably above the lower ends of the slip ways and of the downward extension. I do not find in "Complainants' Exhibit Wilson Reamer" [572] parallel bearing faces on the downward extension and tapering dovetails in the slip ways, inasmuch as the inside thrust-bearings di-

(Testimony of Arthur P. Knight.)

rectly above the spreading-bearings, on the prongs or parts of the downward extension in this underreamer, taper slightly downward; and the dovetails in the slip ways are parallel to the axis of the body. As regards their function as thrust-bearings the deviation from parallelism in these bearings on the downward extension is not sufficient to permit or cause any downward movement of the tilt slips due to inward pressure thereon, so that these faces are effective in holding the tilt slips outwardly in normal working position; and are, therefore, considered with regard to this function, substantially although not actually, parallel with the axis of the body, as their deviation from parallelism is not sufficient to affect their action as thrust-bearings in the normal working position of the parts. Considering their action as sliding faces, when the cutters are being drawn down in the slip ways, these bearing faces permit of a slight inward movement of the lower ends of the tilt slips as they descend. When this downward movement of the tilt slips is effected by pressure of the shoe thereon this slight inward movement of the tilt slips is without any substantial effect, as it is not until the shoulders on the tilt slips reach and pass onto the spreading-bearings that the inward movement becomes sufficient to enable the tool to be drawn up in the casing. If the relative downward movement of the tilt slips is due to pressure imposed on their lower ends, these spreading-bearings will co-operate with the parallel-faced dovetails in "Complainants' Exhibit Wilson Reamer" in

(Testimony of Arthur P. Knight.)

such manner that the inner ends or cutting portions of the tilt slips are released from such pressure as they move downward. In the underreamer shown in patent 734,833, the downward movement of the tilt slips accompanied by pressure on their lower ends results in the lower cutting portions of the tilt slips being allowed to move inwardly as the tilt slips move down; this movement being permitted by the taper of the dovetails, so that as regards this [573] effect of releasing the cutting edges, when pinched together, the tapering bearing faces of the downward extension in corelation with the parallel dovetails in "Complainants' Exhibit Wilson Reamer" have substantially the same effect as the parallel bearing faces and the tapering dovetails in the underreamer shown in Double patent 734,833. I do not find in "Complainants' Exhibit Wilson Reamer" the removable key detachably seated on the spring-actuated rod and constituting one feature of the underreamer shown in Double Patent 734,833. In regard to its function of serving as a means of hanging or suspending the tilt slips on the spring-actuated rod, this function is identical and performed in the same manner by a cross-piece in "Complainants' Exhibit Wilson Reamer" as it is by the key in the Double patent 734,833. In regard to the function of removability of the key in facilitating the assemblage of the parts, this special function I do not find in "Complainants' Exhibit Wilson Reamer." Instead of making the key removable, so as to enable the tilt slips to be hung onto the spring-actuated rod after

(Testimony of Arthur P. Knight.)

the rod is inserted in the hollow body, the Wilson structure provides tilt slip suspending means which is integral with the spring-actuated rod and provides removable means for supporting the spring-actuated rod in the hollow body, so that the tilt slips may be assembled on the spring-actuated rod, the latter then shoved up into the hollow body and held in place by the releasable or detachable supporting means consisting of screw pins engaging in the block in the hollow body.

In "Complainants' Exhibit Wilson Underreamer No. 2," I find substantially the same construction and correlation of parts as in "Complainants' Exhibit Wilson Reamer" except in respect of the means for supporting the spring-actuated rod in the hollow body and for furnishing the upper inside bearing for the tilt slips. In this Wilson underreamer No. 2 the spring-actuated rod is provided with a key-way through which extends a key seated in the [574] walls of the hollow body, said key engaging the lower ends of the spring to support the same and thereby hold the spring-actuated rod in position. The lower portion of this spring-actuated rod in this Wilson underreamer No. 2 is provided with flat faces directly above the cross-piece or key portions thereon to serve as inside upper bearing faces for the tilt slips. A key engaging the spring as above stated performs the same function as the block within the hollow body in "Complainants' Exhibit Wilson Reamer" and as the shoulder within the hollow body of the Double patent 734,833. The flat bearing por-

(Testimony of Arthur P. Knight.)

tions on the lower portion of the spring-actuated rod, in "Complainants' Exhibit Wilson Underreamer No. 2," directly above the key projections thereon, serve the same purpose as the lower portions of the block within the hollow body of "Complainants' Exhibit Wilson Reamer," and the same purpose as the upper portions of the flat parallel bearing faces on the downward extension in Double patent 734,833.

I, therefore, find, in underreamer shown in Double patent 734,833, in "Complainants' Exhibit Wilson Reamer," and in "Complainants' Exhibit Wilson Underreamer No. 2," and in each and every one of them: A hollow body; a spring-actuated rod mounted within the hollow body, and said spring being supported by the hollow body so as to tend to draw said rod upwardly; tilt slips mounted to slip vertically and to tilt inwardly and outwardly in a downward extension of said hollow body and hung on said rod so as to be drawn upwardly by said spring; and spreading-bearings on said downward extension engaging with parts on the tilt slip to expand the tilt slips and spread their lower cutting edges apart as the tilt slips are forced upwardly into working position by said spring. The stated parts co-operate to expand the tilt slips to cutting or working position when it passes below the shoe and to collapse the cutters to enable them to pass within the casing as it passes up within the shoe in the same manner and by the same mode of operation in the said patent, in "Complainants' Exhibit Wilson Reamer" and [575] in "Complainants' Exhibit Wilson Underreamer No. 2." I also find in the underreamer

(Testimony of Arthur P. Knight.)

shown in Double patent 734,833, in "Complainants' Exhibit Wilson Reamer," and in "Complainants' Exhibit Wilson Underreamer No. 2," the tilt slips vertically and tiltingly movably in slip ways on the downward extension of the body; the said slip ways being provided with dovetails which co-operate with dovetails on the tilt slips to furnish outside bearings for the tilt slips; said tilt slips engaging at their upper ends with thrust-bearings on the body and having inside upper bearings in fixed relation to the body as regards inward movement, and having lower inside bearings which take the inthrust due to inward pressure on the cutting edges; said inside lower bearings being directly above the spreading-bearings on the downward extension of the body, so that in each case the tilt slips are firmly held when in working position against upthrust, lateral thrust, inthrust, and outthrust; and in this respect the stated parts of the said patent and of "Complainants' Exhibit Wilson Reamer" and "Complainants' Exhibit Wilson Underreamer No. 2," operate by the same mode of operation.

I also find in each of these exhibits, Double Patent No. 734,833, "Complainants' Exhibit Wilson Reamer," and "Complainants' Exhibit Wilson Underreamer No. 2," the downward extension slotted to permit portions of the tilt slips to extend outwardly from the slip ways through the sides of the tool to engage with the casing and with the shoe at a point considerably above the lower ends of the slip ways and of the downward extension so as to provide

(Testimony of Arthur P. Knight.)

for a considerable inward and outward throw of the cutting edges of the tilt slips, so as to remove the cutting edges from the casing when they are collapsed, sufficiently to insure that the cutting portions will be free from any obstructions in the casing when the tool is being lowered in the casing. In this respect the parts of the underreamer shown in the Double patent 734,833, and "Complainants' Exhibit Wilson Reamer" and "Complainants' Exhibit Wilson Underreamer [576] No. 2," have the same relation of parts and the same mode of operation.

In respect to the taper of the dovetails and the flat parallel bearing faces in Double patent 734,833, I find that the straight or parallel dovetails and the slightly inclined inner thrust-bearings on the lower portions of the downward extension or prongs, of "Complainants' Exhibit Wilson Reamer" and "Complainants' Exhibit Wilson Underreamer No. 2," have an equivalent relation and equivalent mode of operation to that of the stated parts in the said Double patent. I find that instead of the removable key shown in the Double patent and the integral shoulder on the hollow body shown in said patent, that there have been substituted in "Complainants' Exhibit Wilson Reamer" and "Complainants' Exhibit Wilson Underreamer No. 2," an integral key or tilt slip engaging means on the spring-actuated rod, and a releasable means on the hollow body for supporting the spring; while the purpose and result of these are the same in either case, namely, to facilitate or enable the insertion and withdrawal of the

(Testimony of Arthur P. Knight.)

parts, the mode of operation in this respect is not the same.

Recalled.

Direct Examination Resumed.

A. 15. "Defendant's Exhibit Wilson Patent 827,-595" shows and describes an underreamer which is substantially the same as "Complainants' Exhibit Wilson Reamer," the only difference being in minor details of construction as follows: The bearing block forming a seat or shoulder for the actuated spring to rest on is shown at 7 in the said patent in the form of a round block, and is held in place by means of two dowel-pins, 8; whereas, the corresponding block in "Complainants' Exhibit Wilson Reamer" is squared at its lower end and is held in place by screw pins.

The squaring of the lower end of this block gives a better inside upper bearing for the tilt slips, but the principle of action and the mode of operation are the same in the patent and in "Complainants' [577] Exhibit Wilson Reamer" irrespective of this change in the block. The only other difference I find is a slight difference in the shape of some of the bearing faces and shoulders on the tilt slips. The rounding shown at shoulder 16 in Figures 8 and 9 in said patent not being noticeable in "Complainants' Exhibit Wilson Reamer," which has, however, a perceptible rounding of the inwardly and upwardly directed corner or shoulder which is adapted to slide on the spreading-bearings, this rounding corresponding in function to the rounding of bearing 16 as set forth

(Testimony of Arthur P. Knight.)

in the first six lines of page 2 of the Wilson patent. The principles of action and mode of operation of these parts, as well as all the other parts of the underreamer, are the same in "Complainants' Exhibit Wilson Reamer" and in "Defendant's Exhibit Wilson Patent."

A. 16. The construction of "Complainants' Exhibit Wilson Reamer" being substantially the same as that shown in "Defendant's Exhibit Wilson Patent," I will identify the parts of the Wilson reamer by reference to the drawings and specifications of said patent. In the Double patent the thrust-bearings on the body are indicated at 8 in the drawings, and are referred to as shoulders in the specification. In the Wilson patent these thrust-bearings are indicated at 10 in the drawings, and are referred to as "Down thrust bearings" 10 in the specification. The downward extension in the Double patent includes all those parts in integral and fixed relation with the body and extending beneath the shoulders or bearings, 8; this extension being differentiated from the body proper by reason of its being cut away or slotted to receive the tilt slips and the means for supporting and operating the same; in other words, it includes all those parts which extend downwardly from and are in fixed relation with the body, 1, of the underreamer. It, therefore, includes in the Double patent the portions forming the "upwardly and inwardly sloping tapering dovetail slip ways, 9 beneath said shoulders" in said patent, as well as the portion [578] which extends across between said dovetail portions and to which the numeral 6 is ap-

(Testimony of Arthur P. Knight.)

plied in the drawing. This transversely extending portion of the downward extension is hollowed out or bored vertically to receive the lower portion of the spring-actuated rod and is slotted or provided with a key-way indicated at 7, in which travels the key, 17, for engaging the tilt slips. The entire downward extension of the Double reamer as shown in this patent, constitutes a hollow slotted extension, not only for the reason that it includes the transverse portion just referred to, which is hollow and slotted as stated, but for the reason that it also includes the portions forming the slip ways, 9, and is cut out or slotted between such portions forming the slip ways, forming slots extending outwardly from or between the slip ways so as to allow the tilt slips or portions thereof to project out through the sides of the said extension. In "Defendant's Exhibit Wilson Patent" the downward extension comprises all that part which is in fixed relation with the body of the reamer and extends below the thrust-bearing, 10. In this reamer the downward extension takes the form of two prongs, 2, forming a fork connected near their lower ends by a detachable cross-piece, 11, in the form of a bolt secured by a nut, 12. The transverse portion connecting the slip way portions of this extension in the Double patent is omitted or removed in the Wilson patent except in so far as the cross-piece, 11, may be considered as forming a transverse portion. But this downward extension in the Wilson patent being hollowed out or provided with a transverse slot extending from side to side between the slip way portions, constitutes a hollow slotted ex-

(Testimony of Arthur P. Knight.)

tension. The prongs, 2, in the Wilson patent have shoulders, 2" on the inner faces to form ways, 3, for tilt slips, said ways, 3, having the same function in relation to the tilt slips as the slip ways in the Double patent, and these shoulders corresponding to the dovetail flanges, 29, of the slip ways, 9, in the Double patent. [579] Between these shoulders, 2" in the Wilson patent there is an opening or slot extending vertically between the slip way portions or prongs for permitting portions of the tilt slips to project out through the sides of the extension, these openings or slots corresponding in function to the openings or slots between the slip ways, 9, in the Double patent. The principle of action of the down thrust bearings, 10, in the Wilson patent is the same as the principle of action of the shoulders, 8, in the Double patent, serving in either case to furnish the downward pressure on the upper ends of the tilt slips or cutters in the working operation, so that the downward pressure due to the weight of the body and the parts connected to it is brought to bear on the tilt slips or cutters, forcing the latter to descend and to cut the rock by engagement therewith of their lower cutting edges. The principle of action and the function of the downward extension is the same in "Defendant's Exhibit Wilson Patent" as in "Complainants' Double Patent." In either case the object of this downward extension is to extend along the side of the cutters or tilt slips so as to support the same from lateral displacement and to furnish the requisite bearings for holding the cutters in rigid relation

(Testimony of Arthur P. Knight.)

when in working position, while at the same time providing, by the hollowing out or slotting of this extension, for the reception of the tilt slips or cutters and of the means for operating the same, comprising the adjacent portion of the spring-actuated rod and the key or cross-piece thereon.

The spreading-bearings in the Double patent are indicated at 25 at the lower end of the transversely extending portion of the downward extension of the body, and is referred to in the specification as the rounded face 25 of the lower end of the downward extension, 6, of the mandrel. The spreading-bearings in the Wilson patent are shown at 17, and are referred to in the specification as "beveled end faces 17 of the downwardly projecting lugs 2'." In both the Double and Wilson patent these spreading-bearings are [580] inclined upwardly and outwardly from the center, so that when the shoulders on the tilt slips or cutters drag over these bearings the cutters will be tilted outwardly. The function and principle of action of these spreading-bearings with relation to the tilt slips or cutters are the same in the Wilson reamer, as shown in "Defendant's Exhibit Wilson Patent," and in the reamer shown in "Complainants' Exhibit Double Patent 734,833." In the Double patent these spreading-bearings are on the transversely extending portion which extends between the portions carrying the slip ways; whereas, in the Wilson patent these spreading-bearings are on the portions which carry the slip ways. One consequence of this difference in construction is that the spreading-bear-

(Testimony of Arthur P. Knight.)

ings of the Wilson underreamer, as shown in "Defendant's Exhibit Wilson Patent," are separated by an intervening open space in which there is no bearing action, forming a separate spreading-bearing on each side; whereas, in the Double underreamer, as shown in "Complainant's Exhibit Double Patent," the spreading-bearing is a single continuous surface. The division or separation of the spreading-bearing in the Wilson reamer, however, does not change its principle of action, as the two separated parts are alike in form, and operate simultaneously on corresponding parts of the tilt slips, so that their action is concurrent and similar, and is equivalent in its mechanical spreading effect to a single spreading surface of equivalent bearing area. Another consequence of this separation of the spreading-bearings and the formation of the parts carrying the slip ways instead of on the part extending transversely between the slip ways, is that the spreading-bearings for the tilt slips are removed further from the axis of the tool in the Wilson reamer than is the case in the Double reamer. This outward displacement of the bearing surfaces, however, does not affect their function as spreading-bearings; so that the principle of action and mode of operation of these spreading-bearings in the Wilson underreamer [581] are the same as in the case of the underreamer shown in "Complainants' Exhibit Double Patent," this function being to expand and tilt out the underreamers so as to cause their lower ends provided with cutting edges to project out considerably beyond the body of

(Testimony of Arthur P. Knight.)

the tool into position to perform their function of cutting a hole larger than the body of the tool. In order to hold the tilt slips or cutters in this expanded position, after they have been expanded, the inside thrust-bearings are provided as shown at each side of the transverse portion of the downward extension of the body in the Double patent, and referred to in the specification as "oppositely arranged parallel bearing faces," these thrust bearings being the lower portions of such faces adapted to co-act with the projections of bearing portions, 18, on the tilt slips. The lower inside thrust-bearings in the Wilson patent are shown at 9, and are referred to in the specification as spreading-bearings for holding the cutters 4, apart. These bearings, 9, are formed on lugs 2' at the lower ends of the prongs, and are slightly inclined inwardly and in a downward direction, but are so nearly parallel to the vertical axis of the tool that any inward pressure brought on the cutters is resisted by these bearings, and the cutters are thereby held out against the pressure or strain due to their impact on the rock; the function of these bearings being, in other words, as stated in the patent, to hold the cutters apart, which is the same function as performed by the flat parallel bearing faces on the transverse portion of the downward extension in the Double reamer. By reason of the omission of the transverse portion and the displacement of these thrust-bearing faces outwardly onto the portions carrying the slip ways, these bearing faces in the Wilson reamer are

(Testimony of Arthur P. Knight.)

further apart than they are in the Double reamer and are separated so as to form two faces on each side instead of a single face on each side; but this change in construction or design in no way affects or changes their function [582] as inside thrust-bearings. The principle of action of these bearing faces, 9, regarded as thrust-bearings is the same in the Wilson reamer as the principle of action of the flat parallel bearing faces in the Double patent, co-operating with the inward projections, 18, of the tilt slips.

The upper inside bearings are indicated in the drawing of the Double patent as the upper portions of the at parallel bearing faces on the transverse portion of the downward extension of the body, namely, that portion of the parallel bearing faces against which the inner upper portions of the tilt slips engage when in working position as shown in Figure 1. In the Wilson patent the inside upper bearing faces are the lower faces of the block, 7, which is in rigid relation with the body when the tool is assembled, these faces engaging the upper inside portions of the cutters so as to take the inthrust at such portions. When the parts are in working position, shown in Figure 3, in the Wilson patent, and in Figure 1 of the Double patent, these inside bearings have the same principle of action and the same mode of operation in both the Wilson and Double reamers.

The tilt slips are indicated at 15 in the drawing of the Double patent, and are adapted to bear at their upper ends on their inside bearings aforesaid, and are provided with cutting edges at their lower outside

(Testimony of Arthur P. Knight.)

portions and with inwardly projections or bearings, 18, which are adapted to ride on said parallel bearing faces, and with shoulders or faces, 26, above said bearings or projections, 18, which are adapted to slide on the spreading-bearings, 25, to cause the tilt slip to tilt so as to cause its lower end to move inwardly or outwardly while its upper end remains in contact with the upper inside bearing aforesaid; the principle of tilting being that one end (in this case the lower end) moves inwardly or outwardly while the other end (in this case the upper end) does not move inwardly or outwardly to any material extent. [583] In the Wilson reamer, as shown in "Defendant's Exhibit Wilson Patent," the tilt slips indicated at 4, and referred to in the specification as cutters, are provided with bearing faces 4³, bearing on the lower inside thrust-bearings, 9, in working position, shown in Figure 3; and with "rounded corners or bearings 16" at the upper end of these bearing faces 4³, to ride over the beveled end faces, 17, which constitute the spreading-bearings in this reamer, so as to cause expansion of permit collapse of the tilt slips. In "Defendant's Exhibit Wilson Patent" the cutters engage at their upper ends with the inside thrust-bearings constituted by the lower portions of block 7 in working position; but as the cutter or tilt slips move downwardly relative to the body, for example, in withdrawing the tool through the casing, as shown in Figure 1, these cutters or tilt-slips find a bearing on the outer ends of the cross-piece, 5, of the spring-actuated rod, which holds these upper ends from

(Testimony of Arthur P. Knight.)

moving inwardly under the inward pressure of the shoe and causes a collapsing action to take place by tilting the lower ends of the cutters inward, this being a tilting action since the lower ends move in and out in operation, while the upper ends do not move in and out to any material extent. The tilt slips in both the Double underreamer, "Complainants' Exhibit Double Patent," and the Wilson underreamer, have recesses on their inner faces for receiving and engaging the key or cross-piece for hanging the tilt slips or cutters on the spring-actuated rod. In the Double patent these are referred to as sockets or key-seats, 16, and in the Wilson patent they are referred to as recesses, 18, in the inner faces of the cutters. In each case these recesses or sockets are shown as sufficiently larger than the key or cross-piece to enable tilting of the tilt slips or cutters. The principle of action and mode of operation of these tilt slips or cutters are the same in "Complainants' Exhibit Wilson Reamer," and in "Defendant's Exhibit Wilson Patent," and in the underreamer disclosed in "Complainants' Exhibit [584]. Double Patent 734,833." In the Double patent the bearings on these tilt slips for engaging with the spreading-bearings and with the lower inside thrust-bearings, are located directly on the inner faces of the tilt slips and extend across from side to side. In "Complainants' Exhibit Wilson Reamer" and in "Defendant's Exhibit Wilson Patent," the corresponding bearings on the tilt slips for engaging with the spreading bearings and with

(Testimony of Arthur P. Knight.)

the lower inside thrust-bearings of the extension of the body, are located at each side of the center; this difference in construction or design following necessarily from the division of the said bearing faces on the extension of the body into separate parts at the respective sides, and in no way changing or affecting the principle of action or mode of operation of these bearings either in the spreading action or in holding the tilt slips or cutters apart after they had been spread.

The actuating means for lifting the tilt slips in the slip ways consist, in the reamer shown in "Complainants' Exhibit Double Patent," of the rod, 11, spring, 10, acting on said rod and resting on a shoulder, 5, in the body, and a key, 17, carried by said rod and extending into the sockets in the tilt slips so as to draw the same upwardly. The means for lifting the tilt slips in "Defendant's Exhibit Wilson Patent" consists in the rod or stem, 5', the spring, 6, acting on said rod or stem and resting on a bearing constituted by the block, 7, and a cross-piece or cross, 5, on the said rod extending into the recesses, 18, in the cutters or tilt slips so as to tend to lift the same. In each case the tilt slips are tiltingly hung or suspended on the spring-actuated rod by means of the cross-piece or key, as the case may be, and are drawn upwardly by the spring acting on said rod so as to tend to raise the tilt slips into working position and cause their bearing portions on said tilt slips to ride over the spreading-bearings on the extension of the

(Testimony of Arthur P. Knight.)

body so as to tilt the tilt slips [585] and spread apart their lower ends while their upper ends are suspended on said spring-actuated rod. The principle of action of the means for lifting the tilt slips is the same in the Wilson reamer and in "Defendant's Exhibit Wilson Patent" as it is in the reamer disclosed in "Complainants' Exhibit Double Patent," consisting in hanging or suspending the tilt slips near their upper ends in such manner as to permit their lower ends to tilt or swing in and out and to exert a continual upward pressure on the tilt slips, tending to move them toward and hold them in working position.

Recalled.

Direct Examination Resumed.

A. 18. The Swan patent, 683,352, discloses an underreamer of type in which the cutters are mounted to slide obliquely on the reamer body without any tilting movement. The reamer body, A, in this patent is formed with ways, A⁷, extending obliquely inward and downward at each side, and the cutters or reaming heads, C, slide in these ways, the ways and reaming heads being dovetailed or flanged so as to retain and guide the reaming heads in their sliding movement in the ways. These reaming heads have slots which receive a cross-pin, B⁴, carried by a rod, B, mounted to slide vertically in the body of the reamer and pressed upwardly by a spring, B², which is supported by a bearing on the body, so as to tend to force the reaming heads upwardly. In this

(Testimony of Arthur P. Knight.)

upward movement of the reaming heads they slide in the upwardly and outwardly diverging ways, A⁷, and are thereby caused to separate or expand as they move upwardly, and when they are at the upper ends of the ways they are fully expanded to working position. In order to enable the tool to be lowered through the casing, which is necessarily smaller than the fully expanded diameter of the cutting portions of the reaming heads, it is necessary to move the reaming heads to the lower ends of their inclined ways so as to bring them together before the underreamer can be inserted in the casing. If the underreamer with [586] the reaming heads collapsed in this manner is introduced into the casing, the spring-actuated rod will immediately tend to move the reaming heads upwardly and bring their cutting portions into contact with the casing. If, then, it be attempted to push the reaming tool down in the casing these cutting portions engaging with the casing will tend to move upwardly relatively to their inclined ways, and will thus be forced outwardly into tighter contact with the casing, so that the device in such circumstances would act as a casing spear, and could not, without some special means for preventing this action, be lowered into the well. For preventing this action and holding the reaming heads in collapsed position until the underreamer passes below the under end of the casing, there is provided, in this underreamer, a locking device consisting of trips, F, which are mounted to slide radially in the body of the reamer and are adapted to engage at their inner ends

(Testimony of Arthur P. Knight.)

with the bevel face of the shoulder, B⁵, on the spring-actuated rod so that when the reaming heads are pulled down to collapsed position these trips may be pressed in to engage over said shoulder and then on inserting the tool into the casing the casing will engage with the trips to hold them into such engagement with the shoulder, thereby holding the reaming heads in collapsed position until the underreamer has been lowered far enough to bring the trips below the shoe at the bottom of the casing; whereupon the bevel face at the upper end of the shoulder on the rod forces the trips outwardly and allows the rod to rise, under the action of the spring, and to raise the reaming heads in their outwardly inclined ways, thereby expanding them to reaming position. In withdrawing the underreamer from the well the outer faces of the reaming heads ungage with the shoe at the bottom of the casing, and as the body of the tool continues to move upwardly, the heads slide in their inclined ways, so as to move inwardly until they have collapsed sufficiently to allow them to pass up within the casing. The [587] cutting portions of these reaming heads remaining in contact with the interior of the casing until the underreamer passes out at the top of the casing. Comparing this construction with "Complainants' Exhibit Double Patent" as to structure, the Swan structure comprises reaming heads which slide in inclined guideways so as to move to expanded or contracted position by oblique sliding movement without tilting; whereas, the Double con-

(Testimony of Arthur P. Knight.)

struction comprises tilt slips which slip in slip ways in the body, and are moved to contracted or expanded position by a tilting operation, in which the lower ends, which form the cutting edges of the tilt slips swing inwardly or outwardly while their upper ends do not move inwardly or outwardly to any material extent. In other words, the Swan reamer is provided with means for engaging and supporting the reaming heads in such manner that each reaming head moves from its collapsed to its expanded position by a sliding movement in which all parts of the head partake in the same degree; whereas, the Double reamer provides means for expanding the lower portions of the tilt slips without correspondingly expanding the upper portions; this means consisting of spreading-bearings on the extension of the reamer body in the Double patent, and the shoulders or bearing faces on the tilt slips engaging such spreading-bearings for expanding the lower portions of the tilt slips, and the means for engaging the upper portions of the tilt slips to restrict or limit their inward and outward movements. In the Double patent the means for restricting the outward movement of the upper ends of the tilt slips as the lower ends are being expanded by reason of the shoulders on the tilt slips riding over the spreading-bearings, is a provision for allowing such upper portions of the tilt slips to engage with the shoe at the bottom of the casing, this action in normal operation taking place when the tilt slips are passing downwardly out of the shoe and

(Testimony of Arthur P. Knight.)

their upper portions are bearing against such shoe, thereby holding such upper portions inwardly while the lower portions are being expanded by the action [588] of the spreading-bearings. The means for limiting the inward movement of the upper ends of the tilt slips in the Double patent, as the tilt slips are being drawn up within the shoe, consists in the upper portion of the flat parallel bearing faces of the transverse portion of the downward extension of the body, which engage with the upper inner faces of the tilt slips to hold them apart while the lower portions are being forced together by the pressure of the shoe, and are being allowed to come together by reason of their shoulders or inward projections riding inwardly over the spreading-bearings. This difference in the principle of coaction also leads to a difference in the mode of operation in so far as concerns the relations of the cutting edges of the tool to the parts liable to engage therewith. In the Swan reamer, inasmuch as the reaming head does not tilt, the cutting edge is necessarily always the most expanded portion of the reaming head, for the reason that in expanded position it must project further than any other portion in order to do its work; and in collapsing it does not change its position relatively to the other parts of the reaming head, so that it always remains the most expanded portion. In consequence of this, if any portion of the reaming head contacts with the casing it will be this cutting portion; and inasmuch as the cutting edges are outwardly and downwardly

(Testimony of Arthur P. Knight.)

directed, such contact, as above pointed out, prevents the lowering of the reamer in the well, and it is therefore necessary to provide a locking device to hold the reaming heads temporarily in collapsed position until they are passed below the bottom of the casing. With the Double underreamer, which operates on the tilt slip principle, the cutting edges are not the most expanded portions except when the tilt slips are in expanded position. When the tilt slips are in collapsed position their most expanded portions are, as shown in Figure 3, of the Double patent, considerably above the cutting portions of the tilt slips and nearer the upper than [589] the lower ends of the tilt slips, so that by providing the slots in the sides of the extension of the reamer body, so as to enable these bearing portions of the tilt slips to come in contact with the shoe, and by providing the means above stated for limiting the inward movement of the upper ends of the tilt slips while allowing their lower ends to tilt in, the cutting edges of the tilt slips may be swung in so as to clear, by a considerable margin, the inside of the casing. With such construction, it is possible to insert the underreamer into a casing by first collapsing the tilt slips, so as to enable them to pass within the casing, and the cutting edges of the tilt slips will then be held free and clear of the casing by engagement with the casing and outer faces of the tilt slips which project through the slots in the side of the extension of the reamer body; and in this condition the reamer may be lowered in the well without

(Testimony of Arthur P. Knight.)

any liability of the cutting edges catching on the joints or other obstructions in the casing and without the necessity of using any locking or tripping means for holding the tilt slips in collapsed position while they are passing down through the casing. Referring to "Defendant's Exhibit Double Underreamer with Narrow Cutters," this underreamer is substantially the same construction as disclosed in the Double patent, the following minor variations being noted: The spreading-bearings at the bottom of the downward extension of the body having been extended laterally so as to extend clear across the extension of the body; and the tilt slips are provided, in addition to the dovetails shown in the patent, with another set of dovetail flanges which extend out further in a lateral direction than do the main dovetail flanges and terminate at their upper ends on the shoulders which ride on the lateral extensions of the spreading-bearings; these flanges also proportionately widening the bearing portions on the tilt slips which engage with the flat parallel bearing faces on the extension to serve as inside lower thrust-bearings when in working position. These minor variations [590] make no difference in the principles of action or mode of operation of the parts. Referring to "Complainants' Exhibit Double Underreamer," the construction is similar to that shown in "Complainants' Exhibit Double Patent," except in changes in the proportions of the parts and for the following minor variations: The spreading-bearing at the lower end of the exten-

(Testimony of Arthur P. Knight.)

sion is extended clear across, and adjacent thereto the lower ends of the portion of the extension forming the slip ways are cut out in the shape of V-shaped notches, the bits being provided with lateral projections having inside bearing faces adopted to rest on the inner faces of these notches when the tool is in working position; and having inclined outside faces which, in working position, are adjacent to the inclined outer faces of the notches. These minor differences in construction make no difference in the principle of action or mode of operation of the tilt slips in their collapsing and expanding actions and in their co-relation with the spreading-bearings and thrust-bearings on the body and the extension thereof. The principle of action of the Swan reamer, which is that of a sliding and nontilting reamer head, is, therefore, distinct and different from the principle of action disclosed in "Complainants' Exhibit Double Patent," "Defendant's Exhibit Double Underreamer" and "Complainants' Exhibit Double Underreamer," which is that of a tilt slip hung at its upper portion so as to move vertically without material inward or outward movement at its upper portion, and co-operating with bearings on the reamer body so that its lower portion is swung inwardly and outwardly so as to cause the cutting portions at the lower ends of the tilt slips to collapse and incline inwardly away from the casing or to expand and incline outwardly into position to engage the rock to be cut. [591]

The Day patent 403,877 shows a well-boring or drilling apparatus, comprising two cutting tools. B,

(Testimony of Arthur P. Knight.)

carried by relatively thin spring plates, D, the upper ends of which are fastened together. The rod for operating the cutting tools fastens between the upper ends of the said parts and is connected to a block formed at its lower end with a spear point, I, a spring, K, being provided between this block and the upper portions of the supporting means, E, for the cutting tools and tending to press the cutting tools upwardly to bring shoulders, C, thereon against shoulders, H, on the block, G. The cutting tools, B, are provided with recesses, J, on their inner faces, which, in the most collapsed position of the device, receive and engage the spear point, I. When the device is lowered to the bottom of the well the cutting tools, B, and striking the bottom of the well are arrested and the spear point, I, being then forced down by the weight of the rod, F, and by the spring, K, causes the cutting tools, B, to be spread apart into position shown in figure 2 in which their cutting edges are expanded so that the drill is of greater diameter than the exterior of the casing. On withdrawing the tool by lifting the rod, F, the spear point, I, is drawn into the recesses J, and the spring-plates, D, cause the cutting tools to spring together in a collapsed position wherein they may be withdrawn through the casing. In this collapsed position the cutting portions are still the most expanded portions of the cutting tools so that if there is any contact with the casing it will be at these cutting portions. If, therefore, the pressure of the cutting tools on the casing is relied on in this device to

(Testimony of Arthur P. Knight.)

maintain the cutters in collapsed position, such pressure will cause the cutting edges to engage with the casing and tend to force the cutting tools, B, upwardly relatively to the spear point, I, and to move toward the position shown in Figure 2. This operation would cause the cutters to catch or bind more and more tightly in the casing, [592] and in order to prevent this it would be necessary to make the spring plates, D, press inwardly with sufficient force to hold the parts in position shown in Figure 1 without depending on the inward pressure of the casing. This would require the spring plates, D, to be much more powerful in proportion to the spring, K, than is shown in the drawing. With such a construction in which the cutting tools, B, are held out of contact with the casing by the inward pressure of the spring plates, D, the principle of action and mode of operation of this device are quite distinct from that of the Double reamer as shown in "Complainants' Exhibit Double Patent," for the reason that in the Day device, as so constructed, the cutting tools must strike the bottom of the well and be arrested thereby before they can be separated by the action of the spear points; whereas, in the Double underreamer the tilt slips are expanded as soon as they pass below the shoe and do not have to reach the bottom of the well. If, on the other hand, the springs in the Day device are so proportioned that the inward pressure of the casing is relied on to hold the parts in position shown in Figure 1, the principle of action and mode of operation of this device are distinct

(Testimony of Arthur P. Knight.)

and different from that of the Double underreamer in that, in the Day device, in this collapsed position, the cutting members engage with the casing at their cutting edges, and any obstruction or impediment to the downward movement will cause an increase in the pressure of such engagement by reason of the expanding action of the spear point; whereas, in the Double underreamer the engagement with the casing is at a portion of the cutting members which is sufficiently above the cutting edges to throw the cutting edges free and clear of the casing when in collapsed position; and any obstruction in the casing will simply throw the cutting edges further in if they are not already completely collapsed. A further important distinction between this Day underreamer and the Double underreamer, is the absence of the extension of the body of the [593] reamer which extends alongside of the cutting members (tilt slips), braces the same against the lateral displacement, furnishes the slip ways in which the tilt slips move, and supports the dovetail flanges which provide the outside bearings for the tilt slips when in working position. None of these features of the Double reamer, shown in "Complainants' Exhibit Double Patent" is disclosed in the Day patent. The Day patent, therefore, does not embody the principles of action and mode of operation which characterizes the Double reamer.

The Mack patent 492,371, relates to a casing spear, and has no reference to an underreamer such as shown in "Complainants' Exhibit Double Patent."

(Testimony of Arthur P. Knight.)

This Mack patent shows slips which slide on dovetail inclined grooves so that as the slips move downwardly on the bottom of the tool they are expanded into position to grip the casing; this casing spear being adapted to engage the casing to draw the same upwardly. This patent illustrates the casing spear or gripping action which would occur if the locking device in the Swan patent were omitted. This patent, however, does not disclose any of the distinctive features of the principles of action or mode of operation of the Double patent, and in particular it does not disclose tilt slips near the body having an extension in which the tilt slips are mounted to move vertically and to tilt and provided with means for causing tilting movement of the tilt slips.

The North patent 674,793. This underreamer works on a rocking as distinguished from a tilting action of the cutting members. The two cutting jaws, d and d', are pivoted on a crosshead at the lower end of a spring-actuated bar movable in a hollow body and supported by a spring resting on a shoulder. The jaws are so supported that as their lower ends swing inwardly their upper ends above the pivots swing outwardly, and the movement of these upper ends is depended upon to control the position of the jaws, said upper ends engaging in an upwardly tapering socket, b, in the [594] body of the tool, so that as the spring-actuated rod draws the jaws upwardly the upper ends of the jaws are forced together by engagement with the tapering socket and the lower or cutting portions of the jaws

(Testimony of Arthur P. Knight.)

are thereby forced apart or expanded to position shown in Figure 2. This patent shows a hollow body, a spring-actuated rod mounted therein and cutting members which are carried by said rod and are adapted to move vertically with the rod, and to be turned to different positions, but it does not show an extension of the body and provided with spreading-bearings engaging with the cutting members to tilt the same by spreading-action on the lower portions only of said cutting members. In the North patent the action is on the upper portion so that each jaw acts as a lever, the pressure holding it in position being applied at a separate end and the cutting force being applied at its lower end. In the Double under-reamer the pressure both for expanding the cutting members and for holding them apart after they have been expanded is applied at the lower portion of the cutters so that a direct support for the cutting pressure on the cutters is afforded as near as possible to the point of application of such pressure and without depending on the transmission of the force through a pivot. The North patent, therefore, lacks the distinctive principle of action of the Double under-reamer in that it does not have the spreading-bearings or the thrust-bearings for causing tilting action of the cutting members. It also lacks the slotted extension which permits the cutting members to project through the slots of the extension to engage the walls of the casing. In fact, North does not attempt to hold the cutting members in collapsed position for passing down through the casing by engage-

(Testimony of Arthur P. Knight.)

ment of any portion of the cutting members with the casing, but depends on a locking device or latch shown at n, which holds the spring-actuated rod down until this latch passes below the shoe. If this latch were omitted and it were attempted to use the North [595] underreamer by depending on the pressure of the casing to hold the jaws in contracted position, there would be liability of the jaws catching or binding on the casing so as to prevent descent of the underreamer in the casing; and for this reason the latch or locking device is necessary to the mode of operation of the North device as disclosed in his patent. In respect to the mode of operation, therefore, this North device differs from the Double underreamer in that the North device requires a latch or lock for holding the cutting members in collapsed position while they are passing down through the casing; whereas, the Double underreamer, "Complainants' Exhibit Double Patent," requires no lock, but depends on the pressure of the casing on the tilt slips to hold the latter in collapsed position.

Kellerman patent 679,384. Two types of underreamer are shown in this patent. The type shown in Figures 1 to 12 requires some obstruction in the well either at the bottom of the well or else a block indicated by "X" placed across the well at the top of the portion which is to be reamed, such obstruction being necessary in order to engage the wedge, C, which is relied on to expand the cutting members, B', to cutting position. The mode of operation of this underreamer is, therefore, distinct from that of

(Testimony of Arthur P. Knight.)

the Double underreamer, since the Double underreamer requires no obstruction for producing expanding action, such expanding action being effected as soon as the tilt slips pass below the shoe. This form shown in Figures 1 to 12 of the Kellerman patent also differs in construction and principle of action from the Double underreamer, inasmuch as the cutting members, B and B', are not tilt slips, since they tilt but do not slip on the supporting body; and there are no spreading-bearings on the supporting body, but wedge-bearings on a vertically movable actuating member. With such a construction the pressures or jars, due to the cutting action of the cutters, does not tend to hold the cutters into expanded position, but rather [596] to release by the jar-ring action the spreading wedge, C, so that with this construction it is necessary to provide locking means for holding the cutters in expanded position, and this locking means Kellerman provides at O. With such locking means Kellerman also provides special releasing means for unlocking the locking means and for driving out the wedge when it is desired to remove the underreamer up through the casing. This special releasing means consisting of a wedge, J, a carrier, K, therefor; a rope for supporting the carrier; and a weighted member, H. The object of all these parts being to provide means for disengaging the locking device and for holding the spreading wedge, C, in fixed position in the casing while the body of the tool is drawn upwardly so as to withdraw the cutting members, B and B', from the spreading

(Testimony of Arthur P. Knight.)

wedge. The mode of operation of the Kellerman device both in bringing the cutting members into expanded position and in collapsing the same is, therefore, distinct from that of the Double underreamer, wherein the cutting members are expanded without the action of any obstruction in the well such as the block, "X," in the Kellerman patent, and are collapsed simply by passing up into the shoe without the action of the special releasing means H, J, K, L, M, provided by Kellerman for that purpose. In the forms shown in the figures 13 to 16 of the Kellerman Patent, the use of an obstructing block is dispensed with, a spring, S, being provided to force the spreading wedge, C⁴, up between the cutting members, B and B', as soon as the latter have passed beneath the lower end of the casing. If, when the cutting members have been expanded in this manner, it is attempted to raise the tool up through the casing, the expanded cutting members will engage the bottom of the casing; and as they cannot slip vertically on the body, A, but only tilt thereon, the resultant pressure on the cutting members simply causes them to be squeezed tightly onto the spreading wedge, C⁴, without collapsing, so that in order [597] to collapse the cutting members it is necessary to forcibly depress the spreading wedge, C⁴, by means apart from the cutters, and this is done by the operation of the special releasing devices, H, J, K, L, M, above referred to, which, when properly manipulated, serve to hold the spreading wedge down while the rest of the tool is drawn upwardly

(Testimony of Arthur P. Knight.)

so as to allow the cutters to slide up on the spreading wedge and to collapse into position for withdrawal through the casing. Neither of the forms shown in the Kellerman patent, therefore, embody the principle of the tilt slips, of the spreading-bearing on the extensions of the body, of the slotted extension through the slots of which the tilt slips project to engage the casing for holding the cutting portions in collapsed position or the inside thrust-bearings which normally hold the tilt slips in expanded position but enables the tilt slips to slide down over the same and to then collapse by the riding of their shoulders on the spreading-bearings.

Patent to Mack 496,317. In this patent the reaming bits, F, are carried at the ends of long elastic legs, D, extending downwardly from a shank, C. The reaming bits are forced into expanded position by means of a so-called mandrel, J', whose lower end is beveled so that when it is forced downwardly it spreads the reaming bits apart, this mandrel being carried by one member of a toggle device, the other member of which is a telescoping and provided with a spring for forcing the knuckle J² of the toggle device and the mandrel, J, downwardly into expanded position. In passing down through the casing this expanding means is held inoperative by a latch, L, having a projecting end, L³, which projects through a slot in one of the spring legs, D, so as to engage with the casing and hold the toggle from straightening out. As soon as this latch passes below the bottom of the casing it allows the toggle to be

(Testimony of Arthur P. Knight.)

straightened out by the action of the spring and mandrel J' to be shoved down beneath the reaming bits so as to spread the same apart. [598] Even when the reaming bits are in most collapsed position so as to pass down through the casing their most expanded parts are at the cutting edges as shown in Figure 1, so that if this underreamer shown in the Mack patent depended on pressure of the casing on the bits to hold them in collapsed position they would be liable to catch and bind on the casing for the reasons above stated in connection with the Day patent. This Mack patent, therefore, does not embody the same mode of operation or the same principle of action as the Double Underreamer, "Complainants' Exhibit Double Patent," for the reason it does not have the tilt slips or the spreading-bearings for expanding and collapsing the lower ends of the tilt slips by relative vertical movement of the spreading-bearings and tilt slips; nor does it have the extension of the body furnishing lateral support and slipways for the tilt slips; nor provided with slots through which the tilt slips extend to engage the casing at points considerably above the cutting edges so as to throw the cutting edges inwardly away from the casing while such bearing portions are in contact with the casing; nor does this patent show the slipways provided on the dovetails—all of which features are embodied in the Double underreamer, "Complainants' Exhibit Double Patent."

Palm patent 563,054. This is an apparatus for jarring casings and acts, in regard to gripping the

(Testimony of Arthur P. Knight.)

casing, in the manner of an upwardly acting casing spear similar to the Mack patent 492,371 above discussed, and the same remarks as to comparison of this patent with the Double underreamer apply as in the case of the said Mack patent.

Mentry patent 647,605. This underreamer is of the sliding cutter type exemplified by the Swan patent, being provided with cutter-heads, K, which slide on downwardly and inwardly inclined dovetail grooves, and are pressed upwardly by a spring-actuated rod having a key engaging the cutters. Such a construction for [599] reasons above stated requires a locking means or retaining means to hold the cutters in collapsed position until they pass below the casing, since in the absence of any such locking means the cutters would engage with the walls of the casing in such manner that the tool could not be forced down through the casing. The locking or holding means provided by Mentry consists of a wire or cord, P, shown in the dotted lines in Figure 1, which is placed temporarily around the cutters to hold them in contracted position at the bottom of the inclined grooves. This wire or cord being "broken as soon as the bit strikes the bottom or when the cutter strikes any obstacle in the well"; the cutters then being moved to expanded position by the spring, E. This patent, therefore, does not disclose the tilt slips, the spreading-bearings for tilting the tilt slips in their vertical movement relatively to the spreading-bearings, the body formed with an extension carrying the spreading-bearings and slotted to per-

(Testimony of Arthur P. Knight.)

mit of the tilt slips extending through the slots to engage the casing and hold the tilt slips in collapsed position without the use of any locking means.

Sullivan U. S. patent 79,276. This is an expanding reamer for machine-shop work such as are used in drills or lathes for reaming out holes in metal to a given diameter; has nothing to do with an underreaming tool of the Double type, in which the reaming is performed by longitudinal movement; nor does it provide for any collapsing or expanding action in the manner required in a well underreaming tool. The expanding and contracting action in this reamer is done by setting up the parts and not by automatic action due to the movement of the tool within a casing or shoe. This patent, therefore, does not embody any of the principles of action or the mode of operation of the Double underreamer.

Lloyd patent 344,744. This reaming tool comprises two jaws, A' and A^2 , one of which is connected with the supporting shank, the other jaw, A^2 , being pivoted to the jaw A' , and a [600] spreading block, B , being drawn by a spring, C , so as to enter between the jaws and force the same into expanded position. For reasons stated in connection with the operation of the Kellerman patent, which is based on a similar principle, the pivoted jaws, A' , A^2 , cannot be collapsed by simply drawing them up into a shoe or casing without providing for releasing the spreading means, B , by some special device. The special means provided by Lloyd for this purpose consists of catches, G , connected with the spreading means, B ,

(Testimony of Arthur P. Knight.)

and adapted to engage the lower end of the casing or shoe so as to hold the spreading-means, B, down while the jaws A' A² are drawn up off of the spreading-means and thereby allowed to collapse into position for withdrawal through the casing. This patent, therefore, does not embody the distinctive principle of the tilt slips and spreading bearings of the Double underreamer which permits the cutting members to collapse automatically by engagement with the shoe and by a sliding movement of the tilt slips relatively to the spreading bearings; nor does this patent show the body with the extension furnishing lateral supports, slipways and dovetails for the tilt slips, with the principles of operation involved in these several features.

Hobart and Ahearn patent 439,275. This is a rock drill of the rotary type and is provided, in addition to the bottom cutters, with side cutters which are expansible or collapsible so as to provide at will for enlargement of the bore of the drill hole at any point of its length. These bits are mounted to slide on inclined ways, so that longitudinal movement of the bits spreads them apart, and such longitudinal movement is effected by hydraulic pressure furnished through a pipe which supports the drill; this pressure acting on the piston in the cylinder, which piston is connected to the said expansible cutters so as to move the same longitudinally on their inclined ways and expand or contract the same. The mode of operation of this device is distinct from that [601] of the Double underreamer inasmuch as the expan-

(Testimony of Arthur P. Knight.)

sion and contraction is controlled at will through hydraulic means irrespective of the longitudinal movement of the drill or its relation to the casing; and the cutting operation is rotary instead of longitudinal. The principle of action of the Hobart and Ahearn drill is also distinct from that of the Double underreamer in "Complainants' Exhibit Double Patent" in that it does not embody the tilt slips, the spreading-bearings, and the other features above stated, which characterize the Double underreamer.

Deisch patent 526,440. In this patent the bits, C, are mounted in slots in a stock, A, so that their lower ends, acting as cutting edges, project out beyond the body of the stock when in expanded position. A spring-actuated rod carries a spreader-head, D, which engages these bits to move and hold them to expanded position. Locking means are provided for holding this acting rod and the spreader-head down while the reamer is being lowered through the casing, this means consisting of the locking-head, E, mounted on the rod and adapted to engage in a slot, 2, in the stock, and having a portion, e', projecting through the side of the stock to engage the well casing so as to hold the locking device in locking position until it passes the lower end of the casing, whereupon a spring, e³, throws a locking device into position shown in Figure 1, allowing the spreader-head, D, to be raised by spring, J, into position to expand the bits, C. This well reamer, therefore, depends on the use of a locking device for preventing expansion of the bits while they are being lowered

(Testimony of Arthur P. Knight.)

in the well casing, and this is necessary with Deisch's construction for the reason there are no portions of his bits which in the collapsed position, or any other position, extend out further than the cutting edges so as to be adapted to engage with the casing, to hold the bits collapsed and throw the cutting edges clear of the casing. The principle of action of the Deisch reamer is also different from that of the Double [602] underreamer, "Complainants' Exhibit Double Patent," in that it does not embody the tilt slips and the spreading-bearings for spreading out the lower ends of said tilt slips on relative sliding movement of said tilt slips and spreading-bearings; said spreading-bearings being carried by the body and said tilt slips being movable vertically, so that this relative movement is produced automatically in drawing the bits up into the shoe or passing them down out of the shoe by reason of the engagement of the shoe with the bits.

Yorke patent, 475,913. This underreamer comprises cutters at the lower ends of the spring arms, carried by a shank in which is slidably mounted a spring-actuated bar, which is provided with a so-called wedge engaging with inclined bearings on the cutters to force the same apart. The most expanded portions of these cutters are their cutting portions, and, as in the case of the Mack and Deisch patents, means are provided for preventing expansion of the cutters until they have passed below the casing; this means consisting of toggles, *m*, whose outer ends engage with the casing to hold the toggles bent as

(Testimony of Arthur P. Knight.)

shown in Figure 1; and these toggles straightening out under the action of the spring, g, as shown in Figure 2, when they pass below the casing, so as to allow the wedge, k, to force the cutters apart. In this expanded position the wedge, k, so-called, engages between the parallel faces, 1, on the cutters; and if it were not for the special releasing means consisting of the toggle, m, attempted withdrawal of the reamer into the casing would simply bind the parts together, the withdrawing operation depending on the folding up of the toggle, m, by engagement of the casing so as to withdraw the wedge, k, from the faces, 1, of the cutters before the cutters can be collapsed. This patent does not embody the distinctive features of the Double patent, nor the principles of action or mode of operation thereof, inasmuch as it does not disclose the tilt slips; [603] the body on which the tilt slips are mounted to slip and tilt; and the spreading-bearings on the body which engage the tilt slips in their slipping movement to spread their lower ends apart; and the slots in the body through which the tilt slips extend for engagement with the casing.

Allen patent, 294,302. In this patent two so-called supplemental drills, D, are mounted within a guard, B, within grooves in a supporting stem, and are spread apart by bearing faces on the drills riding over part b of the stem. No means are provided for actuating these drills, the mode of operation being that when the tool reaches the bottom of the hole the lower ends of these drills engage said bottom so

(Testimony of Arthur P. Knight.)

as to be forced up relatively to the part by and to be spread apart thereby, and they are then retained in this position by engagement of catches, *e*, with notches, *c*, in the shanks of the drills. In order to enable the collapse of the drills as the tool is being withdrawn through the casing these catches are provided with portions which engage with the casing so as to release the same in this operation. These portions necessarily project beyond the sides of the tool so as to engage with the casing, and are, therefore, liable to be operated by contact with any obstruction at the side of the well, so that when the drills have been expanded by dropping the tool to the bottom of the well, and are then raised for the reaming operation, the engagement of the catches with the casing or with any projecting part in the well would release the drills and allow them to fall into collapsed position again. This mode of operation is distinct from that of the Double underreamer wherein the cutting members are formed as tilt slips operated by direct engagement of portions thereof with the casing or shoe and forced into operative position by a spring-actuated rod so that they do not depend upon being brought to contact with the bottom of the well in order to be expanded to working position, and do not depend upon any catch means [604] for holding them in expanded position.

Carruthers patent, 479,933. This patent relates to a casing spear, and the same remarks apply as in the casing spear patents heretofore considered.

(Testimony of Arthur P. Knight.)

Duncan patent, 662,895. The cutters, C, in this patent are simply pivotally mounted on the body, and are held in expanded position by the simple action of a spring. There are no thrust-bearings in this patent which positively and rigidly hold the cutters into expanded position, the cutters being yieldingly held in expanded position; nor does this patent embody tilt slips of the Double underreamer provided with portions bearing on and widening over thrust-bearings and spreading-bearings as provided for in the Double underreamer.

O'Donnell & Willard patent, 762,435. In this patent the body of the underreamer is provided with a tapering bowl at its lower end, and with a downwardly tapering transverse partition extending across said bowl. The cutting members are formed as jaws having upwardly tapering shanks adapted to fit in the two parts of the bowl at opposite sides of said partition; said shanks being hung on a cross-head on a spring-actuated rod mounted in a hollow in the body. The transverse partition extends below the bottom of the bowl and the cutting jaws have shoulders which engage with the bottom of the bowl to limit the upward movement of the jaws. When this tool is withdrawn into the shoe, the shoe engages with the jaws below the bottom of the bowl; but above the bottom of the transverse partition; so that the pressure of the shoe on the jaws holds the jaws from upward movement; and the continued upward movement of the body withdraws the transverse partition from between the inclined inner faces

(Testimony of Arthur P. Knight.)

of the shanks of the jaws. At this time the inward pressure of the shoe on the jaws keeps these inclined inner faces in tight contact with the inclined faces of the partition, 3, so that during the first part of the movement, [605] at least, the jaws simply slide inward and downward on the partition without any tilting action. As soon as the point of contact of the shoe with the jaw passes below the inclined bearing face at the side of the partition, 3, there is a tendency to rock the lower portion of the jaw inwardly and swing the upper portion of the jaw outwardly. This is, properly speaking, however, a rocking and not a tilting action, as the fulcrum of the motion is not at the upper end of the jaw shank, but at the lower end of the partition; and it is due, not to the riding of a shoulder or inwardly facing bearing of the jaw on a spreading-bearing of an extension of the body, but to rocking of a straight flat face of the shank teetering on the rounded lower end portion of the partition, 3. This is clearly shown in Figure 1, wherein, however, the rocking or teetering motion is emphasized; whereas, the characteristic motion of the jaws in this O'Donnell & Willard reamer is inward and downward sliding movement comparable to that of the Swan patent. This patent, therefore, does not disclose the characteristic features of the Double construction, consisting in a body having an extension, provided with spreading-bearings and tilt slips mounted to slip and tilt in said extension; and provided with shoulders or inwardly facing projections

(Testimony of Arthur P. Knight.)

riding on such spreading-bearings to expand and collapse the lower portions of the tilt slips. This O'Donnell & Willard underreamer further does not disclose the slotted extension of the body and the tilt slips having portions projecting through the slots of the extension so as to engage the shoe or casing at points above the lower ends of the extension and considerably above the cutting edges at the lower ends of the tilt slips so as to provide for throwing the cutting edges inwardly free and clear of the casing by engagement with the shoe of portions considerably above said cutting edges. The portions of the O'Donnell & Willard jaws which engage with the casing or shoe are so near to the cutting edges (see [606] Figure 1) that the amount of inward throw or clearance of the cutting edges would be very small, and extreme nicety in dressing the tools would be necessary in order to prevent the cutting edges from catching on slight obstructions in the casing, if, indeed, it would be possible to prevent such catching. This O'Donnell & Willard patent furthermore does not embody the dovetail slip ways for furnishing outside bearings for the tilt slips when in working position while permitting projection of portions of the tilt slips to the outside of said slip ways and between the sides of the dovetail slip ways for engagement with the casing or shoe as stated. A spring-pressed bolt, 16, is provided in the O'Donnell & Willard underreamer to lock the cross-head on the spring-actuated rod from downward movement relative to the stock or body when the latter is drawn

(Testimony of Arthur P. Knight.)

up, this bolt being released through the action of the pin, 21, engaging the shoe when the reamer is drawn up within the shoe at the bottom of the casing. This presents a different mode of operation than that of the Double patent, in which the spring-actuated rod and key or cross-head thereon are not restrained from downward movement except by the action of their supporting springs.

A. 20. This Plotts patent 668,340 shows an underreamer in which a cutter is pivotally mounted in a recess in the reamer body and is adapted to be collapsed in said recess or to swing out so as to project beyond the side of the body, this swinging-out action being effected by a spring-actuated rod mounted to slide vertically in the body and operated by a spring contained in a hollow in the body. The principle of action in this underreamer is that of a swinging cutter as distinguished from the tilt slip action of the Double underreamer, as shown in "Complainants' Exhibit Double Patent" and "Defendant's Exhibit Double Reamer," and in "Defendant's Exhibit Wilson Patent," and in "Complainants' Exhibit Wilson Reamer." This Plotts reamer differs in its mode of operation from the [607] Double reamer in that it is swung out by direct swing action and not by riding shoulders on the cutter over spreading-bearings in a vertical slipping movement of the cutter relatively to the body. In the Plotts reamer there is no relative slipping movement of the cutter relatively to the body, and no riding of any shoulders or projecting portions of the cutter over spreading-

(Testimony of Arthur P. Knight.)

bearings, and no engagement of bearing portions on the cutter with thrust-bearings on the body or extension thereof for holding the cutter out to do its work. The principle of action, mode of operation, and correlation of the parts in the Plotts reamer, shown in patent 668,340, is different and distinct from the principle of action, mode of operation, and correlation of the parts in the Double reamer, "Complainants' Exhibit Double Patent," "Complainants' Exhibit Double Reamer," "Defendant's Exhibit Wilson Patent," "Complainants' Exhibit Wilson Underreamer No. 2," and "Complainants' Exhibit Wilson Reamer."

Q. 21. Are you familiar with "Defendant's Exhibit, page 82, Oil Well Supply Company's Catalog of 1900"? A. Yes, sir.

Q. 22. Will you please explain the mode of operation and interrelation of the parts of the underreamer or device illustrated in this exhibit, page 82, of Oil Well Supply Company's catalog of 1900, and with particular reference to the principles and mode of operation and co-action of the parts in expansion and contraction of the bits; and then compare the same with that of the said Plotts patent to which you have last referred; and also with the Double and Wilson underreamers?

A. So far as can be gathered from this exhibit, this Austrian underreamer comprises two cutters which are mounted to move pivotally in recesses in a body, and a spring-actuated rod is provided which appears to engage with the cutters so as to tend to

(Testimony of Arthur P. Knight.)

force them to move to expanded position in which their outer portions [608] project beyond the sides of the body in the position for cutting, as shown in Figure 1717, which is upside down in the exhibit. The outer ends of these cutters are rounded, and, as shown in Figure 1715, engage with the casing to hold the cutters in collapsed position. The principle of action of this underreamer, so far as can be gathered from this exhibit, is that of a pivoted cutter operated by direct action of the spring, and is distinct and different from the principle of action of a tilt slip operated by riding over spreading-bearings and held out rigidly by engagement with thrust-bearings, as in the Double reamer, exemplified in the Double underreamer and Wilson underreamer, exemplified in the exhibits referred to. The principle of action in this Austrian underreamer, so far as it appears from this exhibit, is the same as that of "Defendant's Exhibit U. S. Plotts Patent 668,340." In both the Austrian and the Plotts reamers the upward strain on the cutters is exerted by leverage in a direction transverse to the length of the cutters when expanded, being taken by barings on the body and by the pivots of the cutters, and having a tendency to bend and break the cutters by transverse strain. In the Double and Wilson underreamers, on the other hand, the upward strain or pressure on the cutters due to the cutting action is imparted lengthwise of the cutters and is taken on fixed shoulders on the body, so that the bending or transverse strains are reduced to a

(Testimony of Arthur P. Knight.)

minimum, practically the whole strain being a direct compression strain lengthwise of the cutters, and being taken directly by the shoulders on the body. In the Austrian and Plotts underreamers, the transverse pressure imparted to the cutters in this manner not only tends to bend and break the cutters, but exerts a shearing strain on the pivots or supporting pins for the cutters; whereas, in the tilt slip construction of the Double and Wilson underreamers there is no shearing strain on the suspending parts or cross pieces, the strain being taken entirely by fixed shoulders on the body and extension thereof. [609]

Q. 23. I now show you "Defendant's Exhibit Fig. 2161, Oil Well Supply Company's Catalog of 1900," and ask you to state if you are familiar therewith.

A. I am familiar therewith to the extent that I have given this exhibit considerable study.

Q. 24. From this exhibit can you point out for us the interrelation of the parts and the principle of co-action of the parts, and expansion and contraction, and mode of operation of the parts?

A. I cannot.

Q. 25. Why not?

A. It is not apparent to me, after careful study of this exhibit, that the same discloses any structure which would be operative according to any definite principle of operation. It does disclose a body with two outwardly and downwardly extending members which, presumably, are cutting bits, and a member extending between these bits. This intermediate

(Testimony of Arthur P. Knight.)

member has inclined faces which appear to engage with shoulders on the bits, but there is nothing to show how these bits are supported, whether they are hung onto the body or onto the said intermediate member, nor does it appear whether this intermediate member is rigid on the body so as to form an extension thereof or is movable thereon, nor any means shown for operating the bits so as to move them to or hold them in the position shown in the figure. If I should attempt any explanation of the operation of this underreamer I should have to guess at the construction, and supply from imagination parts which are not shown in this figure. I am, therefore, unable, from an inspection of this figure, to arrive at any conclusion as to the principle of action or mode of operation of this reamer.

A. 29. In the O'Donnell & Willard patent a locking bolt, 16, is shown for locking the cross-head on the spring-actuated rod from downward movement in the body. In "Defendant's Exhibit O'Donnell & Willard Underreamer" this locking bolt is omitted, and there [610] are provided the parts referred to in said answer to question 351 of W. W. Wilson. This additional feature in the O'Donnell & Willard underreamer comprises a key passing through a slot in the body and extending over the top of the spring-actuated rod; the ring extending around the body and rigidly connected to this key and casing engaging means which are mounted to move in and out through the ring and slip in inclined slots on the body as they are moved vertically relatively to

(Testimony of Arthur P. Knight.)

the body. When the reamer is drawn up into the shoe the shoe engages with these casing engaging means, holding the ring temporarily from upward movement; and, as the body of the tool continues to rise, the key, carried by said ring, engages with the top of the spring-actuated rod, to hold said rod down, while the body rises, thereby moving the cutter jaws positively downward relatively to the body and permitting them to swing in freely, the effect of this action being, as the witness stated, in answer to this question, to take the pressure of the spring off of the cutting jaws in the collapsing action; and this device being in function and effect a lock for preventing expanding action on the cutters as they are being passed into and through the casing.

Q. 30. Then the two differences in the elements, which you pointed out in your last answer, between the "Defendant's Exhibit O'Donnell & Willard Underreamer" and the disclosure and description of "Defendant's Exhibit O'Donnell & Willard Patent," make what difference in the subject matter?

A. The O'Donnell & Willard patent purports to disclose an underreamer which is capable of collapsing without the use of any locking means, whereas, the O'Donnell & Willard underreamer depends for its operation upon this locking means. The mode of operation of these two exhibits is, therefore, distinct and different inasmuch as one depends on a locking means for preventing expansion of the cutters while passing through the casing, while the other [611] does not depend on any such locking

(Testimony of Arthur P. Knight.)

means; the locking means shown in the O'Donnell & Willard Patent" being to lock the cutters in expanded instead of in collapsed position.

Mr. BLAKESLEE.—We move to strike out all that part of the answer which refers to the dependence of this O'Donnell & Willard patent upon any locking means as being merely a guess and not a statement of opinion in expertation, and not the best evidence as to the operation of this reamer which has been testified to by other witnesses.

Q. 31. (By Mr. LYON.) In your explanation of the disclosure of "Complainants' Exhibit Double Patent," you refer to the bearing portions or "inward projections, 18, of the cutters which face inwardly or toward the axis of the tool." Is there any part in the bits or cutters of "Complainants' Exhibit Wilson Underreamer," or "Wilson Underreamer No. 2," for this purpose?

A. In both of these Wilson reamers the inwardly facing shoulders at each side of the lower portion of the cutters which terminate at their upper ends in abrupt shoulders, correspond in function to the inwardly projecting faces, 18, in "Complainants' Exhibit Double Patent." By way of identification I refer to "Defendant's Exhibit Wilson Patent" in which these inwardly facing bearings are indicated at 4³, and are referred to in the specification as expansion bearing faces of the cutters on the sides of said cutters.

Q. 32. Are these portions of the Wilson bits to which you have just referred projected along the

(Testimony of Arthur P. Knight.)

inner or outer faces of the Wilson bits?

A. They are on the inner faces.

Q. 33. And how do their functions compare with the surface, 18, of the Double patent in suit to which you have referred? A. The function is the same.

Q. 34. And how does the shoulder formed at the upper end of these faces, 4³, compare with the function of the shoulders, 26, of the bits of the Double patent in suit? [612]

A. The function is the same.

Q. 35. You say that the function of these surfaces and shoulders is the same. What difference, if any, is there in the manner of performing such function?

A. The function is performed in the same manner in the normal working operation of the underreamer in each case.

I do not agree with Mr. W. W. Wilson that the expansion of the bits of the Double reamer is dependent upon the upward and inward inclination of the dovetails on the body, so far as the normal working operation is concerned.

No. 2996

United States
Circuit Court of Appeals²

For the Ninth Circuit.

Transcript of Record.

(IN THREE VOLUMES.)

WILSON & WILLARD MANUFACTURING
COMPANY, a Corporation,

Appellant,

vs.

UNION TOOL COMPANY, a Corporation, ED-
WARD DOUBLE, ROSA EICHENHOFER,
as Administratrix of the Estate of FRIED-
RICH EICHENHOFER, Deceased, and
GEORGE L. CHADDERDON,

Appellees.

VOLUME III.

(Pages 737 to 1046, Inclusive.)

Upon Appeal from the United States District Court
for the Southern District of California,
Southern Division.

Filed

MAY 10 1917

E. D. Monckton,
Clerk.

United States
Circuit Court of Appeals
For the Ninth Circuit.

Transcript of Record.
(IN THREE VOLUMES.)

WILSON & WILLARD MANUFACTURING
COMPANY, a Corporation,
Appellant,
vs.

UNION TOOL COMPANY, a Corporation, ED-
WARD DOUBLE, ROSA EICHENHOFER,
as Administratrix of the Estate of FRIED-
RICH EICHENHOFER, Deceased, and
GEORGE L. CHADDERDON,
Appellees.

VOLUME III.
(Pages 737 to 1046, Inclusive.)

Upon Appeal from the United States District Court
for the Southern District of California,
Southern Division.

(Testimony of Arthur P. Knight.)

Q. 37. What portion, if any, of the Wilson underreamers, either as exemplified in "Complainants' Exhibit Wilson Underreamer," or "Complainants' Exhibit Wilson Underreamer No. 2," or in the Wilson patent, corresponds in function and effect to the parts in the Double reamer related to the upward and inward inclination of these dovetails?

A. The downward and inward inclination of the bearings, 9, shown in the Wilson patent corresponds in function to the upward and inward inclination of the dovetails in the Double patent, the downwardly and inwardly inclined bearings, 9, in the Wilson patent being related to the vertically extending or parallel faced dovetails or shoulders, 2.2, in the Wilson patent in the same manner that the parallel faces on the lower portions of the transverse portion of the downward extension, 6, in the Double patent is related to the upwardly and inwardly inclined dovetails in the slip ways, 9, of the Double patent; the fact that the inclination is on the upper out bearing and the straight or parallel face is on the lower inner bearing in the Double patent, while the inclination is on the lower inner bearing and the straight or parallel face is on the upper outer bearing in the Wilson patent, amounting to the same thing in its mechanical effect.

Q. 38. In your answer to question 14 in referring to the Double [613] underreamer as exemplified in Complainants' Exhibit Double Patent, the patent in suit, you say in referring to these upwardly and inwardly inclined dovetails: "These dovetails, there-

(Testimony of Arthur P. Knight.)

fore, do not come into action in the normal and expanding and collapsing operation except when the tilt slips are fully expanded in the position shown in Figure 1." In this respect how do the dovetails of the Wilson underreamer compare?

A. The same thing is true with respect to the dovetails in the Wilson patent and Wilson underreamer, inasmuch as the dovetails of the cutters and on the slip ways separate as soon as the cutters begin to move downwardly, this separation being due to the bearing faces, 4.3, on the cutters riding downwardly and slightly inwardly on the bearing faces, 9, in the Wilson reamer, thereby causing the shoulders, 4.2, on the cutters riding downwardly and slightly inwardly on the bearing faces, 9, in the Wilson reamer, thereby causing the shoulders, 4.2, on the cutters to incline downwardly and inwardly away from the shoulders, 2'', on the slip ways, so that if these shoulders contact at all it would only be at their upper ends. In the case of the Wilson, as well as in the case of the Double underreamer, when the underreamer is being drawn up within the shoe, the pressure of the shoe is inward on the tilt slips or cutters, so as to hold them toward the inside bearing faces and away from the outside bearing faces; as the pressure is wholly inward, and the outside bearings furnished by the dovetails can only resist outward pressure, they cannot have, in either case, any effect in this inward tilting and downward sliding movement of the cutters or tilt slips as they pass upwardly within the shoe.

(Testimony of Arthur P. Knight.)

Q. 39. Referring to "Defendant's Exhibit O'Donnell & Willard Patent." You have stated that the upward thrust in the underreaming, with both the Double underreamer and the Wilson underreamer, is taken at the upper ends of the shanks of the bits. Compare this with such O'Donnell & Willard disclosure.

A. The only means described in the O'Donnell & Willard patent for taking this thrust is the shoulders, 15 and 15', on the bits [614] which engage with the end of the body. The upper ends of the shanks of the cutting jaws appear to have small flat faces which may engage on the bearings on the body, but nothing is said in the specification as to that.

Q. 40. Referring to the "Defendant's Exhibit O'Donnell & Willard Underreamer," what are the facts in this respect in regard to that device?

A. (Witness again inspects said exhibit.) In "Defendant's Exhibit O'Donnell & Willard Underreamer" these bearing faces at the upper ends of the cutting jaw shanks are not present, as these upper ends are beveled off and in the case of this underreamer the thrust-bearing is wholly at the shoulders corresponding to the shoulders, 15 and 15', in the patent.

Q. 41. Are you familiar with the "Complainants' Exhibit W. W. Wilson Hypothetical Underreamer Drawing"? A. Yes, sir.

Q. 42. In your testimony in regard to the Double underreamer, you have stated that in the collapsing action the tilt slips bear or have a fulcrum at or

(Testimony of Arthur P. Knight.)

near their upper ends on the flat parallel bearing faces and the pressure of the shoe is exerted inwardly on the outer faces of the tilt slips somewhat below this fulcrum but at a considerable distance above the lower or cutting ends of the tilt slips, so that even a limited movement of the portion of the tilt slips, which engages the shoe will produce a comparatively large throw of the cutting edges. To what extent would this be true of the construction illustrated in this W. W. Wilson hypothetical underreamer drawing?

Mr. BLAKESLEE.—This question, and all questions directed at the showing of this exhibit drawing, and the comparison of such showing with any other exhibits in the case, is and are objected to as incompetent, irrelevant and immaterial, and not concerning the issues of the present case, this objection being based upon [615] the objection originally urged against the introduction of this exhibit. And it is repeated that this exhibit drawing discloses a construction not identified as being identical with or having its parts and features all identical with any other exhibit in this case.

A. This feature would not be presented in an underreamer constructed according to this hypothetical drawing, for the reason that the stated feature depends on the projection of the portions of the reamer shanks through the slots or openings in the sides of the extension of the reamer body, so as to enable said portions to bear on the shoe at a relatively high point to give enlarged throw for the cutting edges, while

(Testimony of Arthur P. Knight.)

at the same time providing for the lateral and outside bearings extending down on the shanks of the tilt slips below the points of engagement with the shoe. In this underreamer shown in this hypothetical drawing wherein the shanks do not project through the sides of the extension of the reamer, the tilt slips or cutters can only engage with the shoe or casing below the lower end of the extension of the body.

Q. 43. (By Mr. LYON.) In this respect like what other exhibit in this case to which your attention has been directed does the Wilson hypothetical underreamer correspond, if at all?

Mr. BLAKESLEE.—Objected to as leading.

A. In this respect the underreamer shown in this hypothetical drawing is like the O'Donnell & Willard underreamer.

Q. 44. (By Mr. LYON.) What have you to say as to the comparative mode of operation or principle of coaction of the bits and body of the reamer in expansion and contraction as set forth in this W. W. Wilson hypothetical underreamer drawing, as compared with "Complainants' Exhibit Wilson Underreamer" or "Complainants' Exhibit Wilson Underreamer No. 2"?

A. By reason of the relatively low bearing for the shoe on the tilt slips or cutters, in this hypothetical sketch, the tendency [616] of the pressure of the shoe on the tilt slips or cutters when they reach the lower end of their movement is to cause the same to rock or teeter on the lower ends of the inner thrust-

(Testimony of Arthur P. Knight.)

bearings similarly to the final part of the operation of the O'Donnell & Willard cutters, whereas, with the Wilson underreamers, in which the bearing is provided at a lower relatively high point by reason of the projection of the shanks through the slots in the sides of the extension of the body, the bearing on the shoe does not, in normal operation, pass below the lower inside thrust-bearings, so that this rocking or teetering action is not presented.

Q. 45. Would you then say that the modes of operation and principle of coaction of the bits and body in collapsing or contracting, in this W. W. Wilson hypothetical drawing, and in the Wilson underreamers, are substantially the same or substantially different? A. It is substantially different.

Q. 46. If I understand your testimony correctly, the internal shoulder, 8, on the hollow mandrel or body of the underreamer of "Complainants' Exhibit Double Patent," takes the upthrust of the bits in underreaming? A. Yes, sir.

Q. 47. What takes a similar thrust in "Complainants' Exhibit Wilson Underreamer" or "Complainants' Exhibit Wilson Underreamer No. 2"?

A. The internal shoulder on the hollow body which is numbered 10 in the "Defendant's Exhibit Wilson Patent."

Q. 48. In the Double underreamer you have referred to a downward extension having opposite parallel bearing faces having a keyway therein. Is there anything in the Wilson underreamer corresponding to this; if so, point it out.

(Testimony of Arthur P. Knight.)

A. Referring to the Wilson patent for identification of the parts, the downward extension consists of the prongs, 2, with the crosspiece, 11, connecting the same, and the parallel bearing faces with this downward extension are represented in this patent by the bearings, 9, which are so slightly inclined that they perform [617] the function of parallel bearing faces. And the key way in the downward extension of the Wilson patent is represented by the open space or a portion of the open space between the prongs, 2, within which space the cross-head, 5, on the spring-actuated rod [618] travels vertically, this being the function of the key-way in the Double patent.

Q. 49. In "Complainants' Exhibit Double Underreamer With Enlarged Slot," where is this key-way that you have last referred to?

Mr. BLAKESLEE.—Objected to as leading, and as assuming the presence of such key-way in this exhibit.

A. This key-way is in this exhibit represented by the open space, or a portion of the open space, left between the side members of the downward extension.

Q. 50. (By Mr. LYON.) In this last exhibit to which I have called your attention has the enlarging of the slots changed in any manner the interrelation of the parts or their modes of operation; and, if so, point out in what respect?

Mr. BLAKESLEE.—Objected to as leading, and as assuming that there has been an enlargement of

(Testimony of Arthur P. Knight.)

any slot in this exhibit.

A. No, sir, it has not changed the mode of operation or the interrelation of the parts.

Q. 51. (By Mr. LYON.) Comparing this "Complainants' Exhibit Double Underreamer With Enlarged Slot" with "Defendant's Exhibit Double Underreamer," in what respects do they differ?

A. The transverse portion of the downward extension has been cut away at its middle portion to form a transverse slot extending through the extension from side to side of substantially the same width as the slot between the inner faces of the dovetails.

Mr. LYON.—You may cross-examine.

Cross-examination.

In referring to "Complainant's Exhibit Double Patent," I do not find any exact definition in the specification of this downward extension except by reference to a number on the drawing and by a statement of its functions. The number is number 6. That term Hollow Slotted Extension must refer to No. 6 in the specification. The hollow in this extension is a space or hole in [619] which the spring-actuated rod plays.

Q. 57. And the slot in this extension is the opening cut through this extension and through this hollow and in which the key plays vertically, is it not?

A. That is a portion of the slot, yes, sir.

Q. 58. I am only talking now about the slot in the part which the specification discloses, as you have testified, as an extension. That slot is the one I have referred to in my last question, is it not?

(Testimony of Arthur P. Knight.)

A. I take it that the slot you are referring to is the slot numbered 7 in the drawing, and referred to in the specification in some places as a key-way.

Q. 59. That is the one I am referring to, yes.

A. This is only a portion of the slot in the hollow slotted extension.

Q. 60. Where is the rest of that slot?

A. In those portions of the extension which are at each side of the transverse portion to which the leader line from the numeral 6 leads. I will say in this connection that in patent office drawings, wherever a part is shown partly in section and partly in elevation at the back, it is usual to apply the numeral to the part shown in section, unless otherwise it would lead to confusion; and therefore I take it that this numeral 6 only identifies the downward extension as a whole while referring to this part of it which is presented in section in the drawing.

Q. 61. The upwardly and inwardly sloping tapering dovetail slip ways on the body and the shoulders on the body which receive the upthrust of the cutters, are given separate and independent reference numerals in the specification of this patent, are they not?

A. Yes, but this is the universal practice in the patent drawings, to apply additional numerals to subordinate parts of a member which has already been given a numeral designating it as a [620] whole; in fact, the specification of the Double patent may be read as indicating the slip ways either as the

(Testimony of Arthur P. Knight.)

channels in which the tilt slips travel or as the confining walls which form such channels.

Q. 62. And these parts are given a distinct and separate reference identification in the Double patent specification, are they not? A. Yes, sir.

Q. 63. And there is no statement in this specification that these parts, nor the parts or shoulders, 8, come within the broad designation of "hollow slotted extension," is there?

A. I do not find in the specification any definite reference to the hollow slotted extension, so I cannot answer the question.

Q. 64. Do you find anywhere in the specification of this patent any reference to the shoulders, 8, or the slip ways, 9, or either of them, as being part of the extension, 6?

A. I think that the statement in lines 50 to 55, page 1, of the Double specification, is capable of being read in the sense that the shoulders, 8, and the slipways, 9, are a part of the extension along with the oppositely arranged parallel bearing faces and the key way, 7, therein, the language being as follows: "A downward extension 6, with oppositely arranged parallel bearing faces having a key way 7, therein, shoulders 8 at the sides of such extension, and upwardly and inwardly sloping tapering dovetail slipways 9 beneath said shoulders."

Q. 65. The shoulders, 8, are unaltered portions of the stock of the hollow mandrel or body, 1, are they not?

A. They are portions of the body, 1, but I could

(Testimony of Arthur P. Knight.)

not say that they are unaltered, since they are formed by the cutting away of the portions of the body to form the extension and mark the upper limit of the extension.

Q. 68. Now, in "Complainants' Exhibit Wilson Reamer," or "Complainants' Exhibit Wilson Reamer No. 2," do you find any part like the part identified and described as the extension, 6, in "Complainants' [621] Exhibit Double Patent"?

A. Before answering that question I would have to know whether you limit the extension, 6, to the transverse portion extending between the slip ways or to the extension downwards from the hollow body below the thrust-shoulders.

Q. 69. I limit it to the part to which the leading line to the reference character 6 extends in the drawing of the Double patent in suit, namely, the part having flat parallel outer faces, a vertical internal hollow, and a vertical transverse slot cutting such hollow.

A. According to the definition you have given—read that question before that, please. (Question No. 68 read by the reporter.) According to the definition you have given in your question of this extension I find substantially the same extension in the "Complainants' Exhibit Wilson Reamer" and "Complainants' Exhibit Wilson Underreamer No. 2."

Q. 70. Please describe such extension, referring to such exhibit.

A. This extension consists of the portion of these

(Testimony of Arthur P. Knight.)

underreamers which is below the thrust-shoulders at the upper ends of the prongs and includes these prongs, the cross-piece or bolt near the bottom of the prongs, and is formed with an internal space between the prongs, which is both a hollow for receiving the spring-actuated rod and a slot for receiving the key or cross piece on said rod and for receiving the shanks of the cutters.

Q. 71. The hollow and the slot referred to are one and the same open space, are they not?

A. Yes, sir.

Q. 72. Where are the parallel flat faces of this extension as you testify you find it in the Wilson underreamer?

A. They are near the lower ends of the prongs just above the spreading-bearings, these being substantially parallel to the extent that they perform the function of parallel faces as thrust-bearings.
[622]

Q. 73. They are not parallel, are they?

A. Not absolutely.

Q. 74. And there are four of such faces, are there not? A. Yes, sir.

Q. 75. And there is an entirely open space between the adjacent edges of the faces of such parts, with the exception of the round cross-bolt, is there not?

A. Yes, but this does not in any way affect the mode of operation of each pair, which acts in effect as a single bearing face.

Q. 82. Now, defining the extension of the Double patent structure as the part 6 having outer flat par-

(Testimony of Arthur P. Knight.)

allel faces and a longitudinal hollow and a longitudinal transverse slot, the slip ways, 9, are on the body, 1, and an integral portion thereof, are they not?

A. If you mean by this that they are on the body and not on the extension, I do not think so.

Q. 83. They are not on the extension, 6, as defined in my last question, are they?

A. Yes, sir, in my opinion they are.

Q. 84. What connects them with the extension, 6?

A. As shown in Figures VII, and VIII they are integral with the extension, 6, and form an integral portion thereof.

Q. 85. And they are likewise integral with the hollow mandrel or body, 1, are they not?

A. Yes, sir.

Q. 86. Now, in addition to resisting outward strains of the cutters, the co-engaging dovetails on the cutters, and on the lower end of the body, of the Double patented underreamer, cause the tilting of these cutters when the cutters are longitudinally moved during such co-engagement, do they not?

A. No, sir, not according to the mode of operation described [623] in the patent.

Q. 87. Is there anything shown in the drawings or disclosed in the specification of this patent to prevent such tilting action during such longitudinal movement of the cutters with said dovetail co-engagement?

A. I have already testified that in normal operation of the tilt slips, which is the operation described

(Testimony of Arthur P. Knight.)

in the patent, the dovetails move out of engagement as soon as the sliding movement commences, so that I do not see that I can answer your question.

Q. 88. Is there anything shown in "Complainants' Exhibit Double Underreamer" or in "Defendant's Exhibit Double Underreamer," to prevent such tilting action of the cutters in longitudinal movement of the cutters with the dovetails in such coengagement?

A. Yes, sir, the projection of the shanks of the cutters in such manner that they engage with the shoe above the lower inside thrust-bearings, so that the inward pressure of the shoe holds the cutters in engagement with the inside bearing faces, and moves them away from engagement with the outside bearing faces constituted by the dovetails as soon as the sliding movement commences. In the Double construction this separation is due to the tapering of the dovetails which leads to separation by longitudinal movement.

Q. 89. Leaving the casing and shoe out of consideration, are you able to state what tilting action of the cutters of the Double reamer takes place during the operation of the reamer beneath the shoe?

A. In the operation of the reamer beneath the shoe the pressure on the cutters or tilt slips is at their lower outside edges constituting the cutting edges. If, for any reason, there is an inward pressure on these cutting edges, imparted from the walls of the well, there will be a tendency for the lower ends of the cutters to move inwardly, rocking on the

(Testimony of Arthur P. Knight.)

inside thrust-bearings [624] and causing their upper ends to move outwardly; this outward movement being limited and governed by the outside bearing faces constituted by the dovetails, so that if during this inwardly pressing action on the cutting edges there is also a downward dragging action on the cutters, causing them to slide downwardly in the slip ways, there will be an outward movement of the upper ends of the cutters or tilt slips, which outside movement increases as the tilt slips descend by reason of the taper of the dovetails and the resulting increase in width of the ways within the dovetails.

Q. 90. Now, if these same conditions exist and the cutters move upwardly, will not the coaction of these dovetails produce a tilting of the cutters in the opposite direction, causing an expansion or partial expansion of the lower ends of the cutters?

A. Yes, sir.

Q. 91. I take it, from what you have recently stated, that the principal pressure upon the cutters, when they are reaming in the hole, is inward pressure at the lower ends of the cutters—am I correct?

A. There is nothing that I have said that I know of to justify any such conclusion, as I do not know what is the principal pressure.

Q. 92. Possibly I am erring in defining that as the principal pressure, but there is such pressure as you understand it, is there not?

A. In the conditions necessarily arising at the bottom of the well drilled in rock of varying hard-

(Testimony of Arthur P. Knight.)

ness, I do not see how there can be any escape from the conclusion that there will be inward pressures at some times, outward pressures at other times, upward pressures and probably sometimes downward pressures, due to dragging or pinching of the tool in being raised, so that in answer to your question I would say that, in my opinion, such [625] inward pressures would exist at time.

Q. 93. And these inward pressures are imparted to the flat parallel faces of the extension, 6, through the shoulders, 18, are they not? A. Yes, sir.

Q. 94. And in "Complainants' Exhibit Double Underreamer" these inward pressures are imparted also through the lateral extensions on the cutters to the flat faces upon the body beneath the V-shaped notches on the body, are they not? A. Yes, sir.

Q. 95. In "Complainants' Exhibit Double Patent," the inside bearings for the cutters are the portions of the flat parallel faces of the extension, 6, above the inwardly inclined faces, 25, on said extension, are they not? A. Yes, sir.

Q. 96. And there are no such flat parallel inside bearings at the lower portions of the prongs of the Wilson underreamer, are there? A. Yes, sir.

Q. 97. Please point them out.

A. I can do this best by reference to the Wilson patent wherein these bearings are indicated at 9 directly above the spreading-bearings or bevel end faces, 17, at the bottom of the prongs.

Q. 98. You don't wish us to understand that these surfaces are parallel, do you?

(Testimony of Arthur P. Knight.)

A. They are not absolutely parallel, but they are parallel in that they perform the function of parallel faces.

Q. 99. There is a divergence between the planes, of these faces, 9, is there not?

A. Yes, sir, a slight divergence.

Q. 100. And with the lateral extensions on the cutters of the Wilson reamer moving over such faces, 9, such lateral extensions [626] are bound to either diverge or converge in such movement, are they not?

A. Yes, sir, slightly.

Q. 101. Now, in "Complainants' Exhibit Wilson Underreamer," or "Complainants' Exhibit Wilson Underreamer No. 2," or "Defendant's Exhibit Wilson Patent," if there is any downward extension shown it comprises two spaced prongs separated throughout their entire lengths by a single open space or hollow, bridged near its lower portion by a round removable bolt, does it not? A. Yes, sir.

Q. 102. Now, the cutters of the Wilson underreamer are guided or confined in their movements outwardly, and are caused to tilt or rock entirely by the coaction of parts of the cutters with the spaced prongs of the lower end of the body and with nothing between such prongs, are they not?

A. They are confined outwardly in their collapsing movement by the pressure of the shoe and are caused to tilt inwardly by coaction of bearings on their inner faces with spreading-bearings on the downward extension of the body, and by engagement at their upper ends with means for resisting inward

(Testimony of Arthur P. Knight.)

movement at such upper ends, said means consisting initially of the lower faces of the block, 7, shown in the body of the reamer in the Wilson patent, and through the rest of the movement consisting of the so-called cross which engages in the recesses, 18, in the inner faces of the cutters.

Q. 103. And that block, 7, is a detachable part, is it not?

A. Detachable, yes, but immovable during the working operation.

Q. 104. And it has no transverse slot, has it?

A. No, sir.

Q. 105. And it is entirely above the cross or T-head? A. Yes, sir.

Q. 106. And the cross moves with the cutters, does it not? [627]

A. As far as concerns their vertical movement, yes.

Q. 107. And the extension which you have referred to in the Wilson reamer consists of two spaced prongs, 2, does it not?

A. Yes, and in my opinion includes the cross-piece, 11, also.

Q. 108. You mean the removable retaining bolt at the bottom? A. Yes.

Q. 109. And there is no slot or hollow in that bolt, is there? A. No, sir.

Q. 110. And the slip ways or dovetails with which the dovetails on the cutters coact are on the prongs referred to by me, are they not? A. Yes, sir.

Q. 111. And the upper thrust-bearings such as 10

(Testimony of Arthur P. Knight.)

in the Wilson patent, are on the body and entirely between these prongs, are they not? A. Yes, sir.

Q. 112. Now, the bearings or shoulders at the sides of the cutters of the Wilson underreamer never engage with the block, 7, do they? A. No, sir.

Q. 113. Nor do such lateral bearing shoulders ever engage with the cross or T-head, do they?

A. No, sir.

Q. 114. And the opening between the slip ways in the Wilson reamer which permit the slips to project or extend outwardly between the dovetails, is the same opening that extends all the way through between the prongs, is it not?

A. It is a part of the same opening.

Q. 115. How do you arrive at the conclusion that the deviation from parallelism in the surfaces, 9, of "Defendant's Exhibit Wilson Patent," is not sufficient to permit or cause any downward movement of the tilt slips due to inward pressure thereon?

A. For the reason that the taper or inclination of these faces [628] as shown in the drawing is such that any inward pressure with the ordinary coefficient of friction of metallic surfaces would not, in my opinion, cause a downward sliding action of itself; and for the further reason that if the inward pressure would cause the downward sliding action, then these faces would have the same function as the bevel end faces, 17, and there would be no reason for the sharp demarkation or differentiation between these faces 9 and 17; also for the reason that in the Wilson patent it is stated, "9 designates the spread-

(Testimony of Arthur P. Knight.)

ing-bearings for holding the cutters 4 apart." also "the spreading-bearings 9 of the lugs 2' engage the expansion bearing-faces 4³ of the cutters at the same time, so that the tool is practically a unit during the operation of underreaming"; also, "when the cutters are fully drawn up they seat on the down thrust bearing 10 and the spreading bearings 9, while the shanks are rigidly held throughout their length. Said spreading-bearings are on lugs 2', which constitute wedges for wedging the cutters apart, and said bearings are at the sides of the lower ends of the body, thus engaging the outer edges of the cutters to hold the cutters apart." This, in my opinion, leads to no other conclusion but that these bearings, 9, hold the cutters apart, and therefore act in the manner of parallel bearing faces as distinguished from spreading faces, in their primary function.

Q. 116. But it is true, is it not, that with the upper ends of the cutters held from outward or inward movement during the traverse of these faces, 9, by the lateral shoulders on the Wilson cutters, the lower ends of the cutters will be caused to move relatively either in approach or separation?

A. Yes, sir, slightly.

Q. 117. And no tilting action can take place under the same conditions when the shoulders, 18, of the cutters of the Double Underreamer are in contact with the flat parallel faces of the extension, 6, the dovetails of the cutters and on the body being [629] held out of engagement; is that not correct?

A. This slight tilting action does not occur in the

(Testimony of Arthur P. Knight.)

Double underreamer under the conditions stated. This condition, however, is that which occurs in normal operation in passing up in the shoe and the slight tilting action of the Wilson reamer under these conditions is not effective in producing sufficient collapse to enable the cutters to pass up within the shoe, this effective action not being secured until the spreading-bearings are reached.

Q.118. But this slight tilting action so caused in the operation of the Wilson underreamer constitutes an effectual initiation of collapsion and termination of expansion, does it not?

A. Yes, sir, as far as it goes.

Q. 119. You don't find any key in the Wilson patent, or in either of the Wilson reamer exhibits, such key engaging with the cutters and holding them upon the spring-actuated rod, do you?

A. I consider the cross piece on the spring-actuated rod such a key.

Q. 120. There is no key-way on the spring actuated rod to receive this key and permit its attachment or detachment, is there? A. No, sir.

Q. 121. The key or block engaging the spring at its lower end and in "Complainants' Exhibit Wilson Underreamer No. 2," or "Complainants' Exhibit Wilson Underreamer," respectively, while holding or stopping the spring, at the same time permits assembling of the spring-actuated rod and the cutters at the lower end of the body, does it not?

A. Yes, sir.

Q. 122. And in the Double underreamer, either in

(Testimony of Arthur P. Knight.)

the Patent or the exhibits, the body has to be unjointed to permit the insertion of the spring-actuated rod from above and above the fixed integral shoulder which holds the spring, does it not?

A. The rod might be inserted itself without this unjointing; [630] but, taking the rod and spring as a whole, it would have to be inserted from above.

Q. 123. And also the retaining nut at the upper end of the rod, is that not so? A. Yes.

Q. 124. Inasmuch as the slip ways, 9, of "Complainants' Exhibit Double Patent" are inclined, and their inclination enters into the action of the cutters, are their functions in relation to the tilt slips the same as the parallel dovetails upon the prongs of the Wilson underreamer? A. Yes, sir.

Q. 125. Do you mean to testify that this inclination of the slip ways, 9, in as far as it, by itself, affects the movements of the cutters, is identical with the function of the parallel dovetails on the prongs of the Wilson underreamer?

A. Yes, sir, when taken in co-relation with the co-acting parts the dovetails by themselves could do nothing. It requires also the coaction of the lower inside bearing faces; and the inclination of these lower inside bearing faces in the Wilson reamer co-acting with the parallel dovetails, is the same in effect as the parallelism of the inside bearing faces coacting with the inclined dovetails of the Double reamer, in my opinion.

Q. 126. But there are flat faces concerned in the action of the inclined dovetails in the Double reamer,

(Testimony of Arthur P. Knight.)

whereas, there are inclined faces concerned in the action of the parallel dovetails in the Wilson reamer; is that not correct? A. That is the case exactly.

Q. 127. And this inclining of the dovetails in the Double underreamer necessitates thinning out the metal of such dovetails progressively toward the lower ends thereof, does it not?

A. Yes, or making them thicker at the upper ends, whichever way you choose to put it. [631]

Q. 128. Both of the surfaces, 9 and 17, at the lower ends of the prongs of the reamer disclosed in "Defendant's Exhibit Wilson Underreamer Patent" are in those portions of the prongs which are defined as being downwardly projecting lugs, 2', to spread the cutters apart, are they not? A. Yes, sir.

Q. 129. Now, assuming that in the operation of the underreamers there is a tendency of the cutters to rotate upon their longitudinal axes under the stresses and impacts of various formations, such as boulders and the like, encountered, do not, in your opinion, the lateral extensions of the cutters in the Wilson underreamer, which bear laterally on the shanks of the cutters, upon the surfaces on the prongs, tend more effectually to resist such tendency to rotate or twist than the inner shoulders, 18, on the cutters of the Double underreamer patent and the coengaging flat parallel faces of the extension, 6?

A. No, sir, not when taken in connection with the side walls formed by the slip ways which are, in my opinion, the main factors in resisting rotative or tangential strains.

(Testimony of Arthur P. Knight.)

Q. 130. Is not such rotative or tangential strain imparted directly to the respective prongs of the Wilson underreamer, and thereby, in the main, resisted, taken up and killed at such prong?

A. You are talking, I believe, about strains tending to turn or move the cutter tangentially around the longitudinal axis of the tool. Such strains are resisted most effectively by surfaces opposed transversely to the line of strain, such surfaces in both the Double and Wilson reamers are afforded by the side walls of the slip ways. The resistance offered by the lower inside thrust-bearings, represented by the faces, 9, in the Wilson patent, and the parallel bearing faces in the Double patent, make but a slight angle with the tangential direction, and are ill adapted to resist tangential strain; so that, in my opinion, such tangential strain as may exist will be taken mostly by the side walls of [632] the slip ways, which, as I have stated, are better adapted to resist these strains than the Double underreamer, since they extend lower down. If, however, you intend to refer to an action tending to tip the cutters in a horizontal plane around the centers of gyration of the cutters themselves, then the spreading out of these bearing faces will be of advantage in resisting such strain, as it prevents a greater leverage effect. I do not see, however, how such a gyratory action on the cutters could occur in any material degree.

Q. 131. Such gyratory action would tend to follow inward pressure at the lower ends of the cutters, would it not? A. Not necessarily.

(Testimony of Arthur P. Knight.)

Q. 132. The gyratory actions you refer to are those which concern oscillation upon the axis and transverse of the cutter, are they not?

A. That is one gyratory action, but that is not the one that I supposed that you were referring to.

Q. 133. What is the axis of the gyratory action you have referred to?

A. It would be a vertical axis so that the cutter would tend to turn around a vertical axis due to some inward pressure, say, at one side of the vertical axis.

Q. 134. That is the action you have referred to in those answers in which you have specified the dovetails as resisting such action?

A. The dovetails do resist such action, and more effectively in the Double underreamer than in the Wilson underreamer; but my reference to the dovetails in resisting the rotary action was with especial reference to their resisting rotary strain due to tangential action around the axis of the underreamer as a whole.

Q. 135. Then the lateral extensions of the Wilson cutters and the coacting surfaces, 9, tend best to oppose which of the actions we have been discussing?
[633]

A. The gyratory action tending to spin the cutter around its own vertical axis of gyration.

Q. 136. And the lateral extensions on the cutters of "Complainants' Exhibit Double Underreamer" and the flat lateral faces on the body coacting therewith, will act similarly in resisting such motions, will they not?

(Testimony of Arthur P. Knight.)

A. Yes, sir, but in the Double underreamer this gyratory strain is resisted also by the dovetails at this lower portion.

Q. 137. Which dovetails do you refer to, please; that is, how do they lie with respect to the longitudinal axis of the reamer body?

A. I refer to the lower portions of the tapering inclined dovetails which lie on the inner faces of the slip ways.

Recalled.

Cross-examination Resumed.

(By Mr. BLAKESLEE.)

Q. 138. In the cutters of the Wilson underreamer—and when I use the term Wilson underreamer I comprise the underreamer disclosed in “Defendant’s Exhibit Wilson Underreamer Patent,” and the underreamers constituting “Complainant’s Exhibit Wilson Underreamer,” and “Complainants’ Exhibit Wilson Underreamer No. 2”—do you find any portions such as the inwardly projecting shoulders, 18, of the Double underreamer cutters, arranged to project inwardly of the shanks of the cutters, such projections extending transversely of the shanks?

A. No, sir, but I do find slips or cutters provided with inwardly projecting shoulders.

Q. 139. Do the shoulders which you have last referred to coact with the spreading-surfaces, 9 and 17, on the prongs of the Wilson underreamer?

A. Yes, sir.

(Testimony of Arthur P. Knight.)

Q. 140. Please describe and define these shouders in the Wilson cutters. [634]

A. These may be best defined by reference to the Wilson patent wherein the projecting shoulder is constituted by the expansion bearing faces, 4³, and the shoulders, 16, at the upper ends thereof.

The spillway, 9, on the Double patent reamer body, 1, are, I think, a portion of the extension, 6, although they are likewise integral with the hollow mandrel or body.

Q. 141. You do not refer to the shoulder which limits the shoulders, 4³, at their lower portions, do you?

A. No. sir.

Q. 142. And these shouders, 4³, in so far as they coact with the spreading surfaces on the prongs, are entirely lateral of the shank of the Wilson cutter, are they not? A. Yes, sir.

Q. 143. And these shoulders such as 4³ incline outwardly and upwardly with respect to the inner faces of the shanks of the Wilson cutters so that their facial plane is at an angle with the inner facial plane of the shanks of the Wilson cutters; is that not so?

A. Yes, sir; slightly.

Q. 144. And there is no part of those shoulders which projects inwardly of the inner facial plane of the shank of the Wilson cutter, is there?

A. No, sir.

Q. 145. And the shoulder, 18, of the Double cutter projects inwardly of the inner facial plane of the shank of the cutter, does it not?

A. Projects inwardly with reference only to a por-

(Testimony of Arthur P. Knight.)

tion of the inner face of the shank.

Q. 146. And what portion is that?

A. That portion is between the upper and lower portions and is cut back.

Q. 147. In other words, the metal of the shank is cut out above [635] the shoulder of the Double cutter to form a pocket above the shoulder, thus resultantlly forming the shoulder; is that not correct?

A. Yes, sir.

Q. 148. And there is no such pocket in the inner face of the shank of the Wilson cutter, is there?

A. Yes, sir.

The Double underreamer cutters are weakened by the V-shaped groove across the backs.

Q. 155. Aside from the cutters and the suspending T-rod, in the North patent, there is no inside bearing for the cutters during their collapsion, is there?

A. No, sir.

The Swan patent "Defendant's Exhibit U. S. Swan Patent," discloses a hollow-slotted extension at the lower end of the body. That extension has openings at the sides through which the cutters project laterally so that the cutters may engage with the shoe of the casing in order to permit collapsion of the cutters. The cutters of the Swan patent are, during their collapsing action, guided by engagement of dovetails on the cutters and on the body portion extension, so as to move in straight lines without tilting.

Q. 164. And will you please compare the hollow-slotted extension of the Swan patent underreamer

(Testimony of Arthur P. Knight.)

with the hollow-slotted extension of the Double underreamer as disclosed in "Complainants' Exhibit Double Patent" and "Defendant's Exhibit Double Reamer"?

A. In both the Swan underreamer and the Double underreamer this hollow-slotted extension has ways in which the cutters are movable. In the Swan reamer these ways are guide-ways which restrain the movement to a straight line inclined movement, whereas, in the Double underreamer, these ways are slip ways which permit of tilting as well as vertical movement. In the Swan reamer this hollow-slotted extension controls the movement and position [636] of the cutters wholly by sideways; in the Double underreamer the hollow-slotted extension controls the position of the cutters partly by spreading-bearings which co-operate with shoulders on the cutters to produce the tilting action.

Q. 165. In both of the hollow-slotted extensions of the Swan patent reamer and the Double patent reamer there are vertical bores or chambers to accommodate the spring-actuated rods and transverse slots to accommodate the cutter carrying keys, is that not correct? A. Yes, sir.

Q. 166. And the outer faces of these hollow-slotted extensions in both instances receive in engagement inner surfaces on the cutters in both instances, do they not? A. Yes, sir.

Q. 167. And the ways which confine the cutters against the lateral displacement in both the Swan patent reamer and the Double patent reamer are dis-

(Testimony of Arthur P. Knight.)

posed laterally of these outside faces of the hollow-slotted extension, are they not? A. Yes, sir.

Q. 168. And are not the ways in Swan patent reamer slipways?

A. Yes, sir, and they are also guide-ways; slipways being, according to my understanding, a broader term.

Q. 169. Then that term includes the ways in the reamers of both the Swan and Double patents, does it not? A. Slipways, yes, sir.

Both reamers have shoulders at the upper end of the hollow-slotted extension to receive the upthrust of the cutters. The cutters of the Swan reamer are suspended by a key (but not tiltingly suspended) carried at the lower end of a spring-actuated rod, the ends of the key received in recesses at the inner faces of the cutters. Both reamers have a spring confined within a hollow body. In both cases the reamer body is jointed to permit installation of the spring-actuated rod and spring. With the Swan underreamer and the Double underreamer. [637]

Q. 170. Now, looking similarly at the lower end of the Wilson patent reamer, and at the lower end of "Complainant's Exhibit Wilson Reamer," and at the lower end of "Complainants' Exhibit Wilson Reamer No. 2," with the retaining bolt numbered 11 in the Wilson patent removed, do you find any such H-shaped conformation?

A. Not if the retaining bolt is removed.

Q. 177. During any expansion or collapsion or tilting of the cutters of the Double patent in suit, when

(Testimony of Arthur P. Knight.)

the shoulders, 18, are in engagement with the flat parallel faces of the extension, 6, under any working conditions, the upper ends of the cutters must necessarily slide inwardly or outwardly upon the key, 17; is that not correct?

A. On the contrary, they do not slide in the normal working operation when the collapsion or expansion is due to coaction with the shoe at the bottom of the casing.

Q. 178. I will ask the question to be re-read, if the witness wishes, and call his attention to its scope.

A. Read the question, please. (Question 177 read by the reporter.) In view of the expression "necessarily slide inwardly or outwardly," my answer was correct, as I take it, since this inward and outward sliding does not occur in the normal operation in passing into or out of the shoe, although it may occur in slight degree under special conditions when there is an inward pressure at the lower ends of the cutters accompanied by a downward drag on the cutters relatively to the body.

Q. 179. Now, if the cutters, of "Complainants' Exhibit Double Patent," tilt upon fulera consisting of the shoulders, 18, when such shoulders are in engagement with the flat parallel faces of the extension, 6, must not the upper ends of the cutters necessarily slide upon such key?

A. Under those conditions, yes.

Q. 180. And there are no surfaces in the Wilson reamer, are [638] there, such surfaces being parallel and upon which the cutters swing through

(Testimony of Arthur P. Knight.)

fulcra on the cutters?

A. It seems to me that the bearings of the cutters on the cross-head of the spring-actuated rod, in the Wilson reamer, answer this description.

Q. 181. Well, please answer the question, eliminating such cross-head or T-head in the Wilson reamer, and also consider such surfaces as being those extending generally lengthwise of the body and with which fulcra of the cutters engage intermediate of the ends of the cutters.

A. The lower end portions of the bearing faces, 9, do act as fulcra during the slight rocking or tilting action which ensues while the cutter is passing upwardly after its shoulder leaves the spreading-bearings or beveled faces at the lower ends of these bearings, 9; and while it is passing downwardly before the shoulders on the cutters reach said spreading-bearings. In this movement there is a slight deviation or change in inclination of the cutter due to the fact that its upper end remains at substantially the same distance from the axis of the tool while its lower end moves slightly in or out, as the case may be, by reason of the inclination of these faces, 9; therefore, inasmuch as the bearing faces on the cutter are in contact throughout this movement with the faces, 9, they must rock or flucrum on these faces to a limited extent.

Q. 182. And these faces, 9, do not come within my question as being parallel faces, do they?

A. They are not absolutely parallel, no, sir.

The cutters of the Canadian underreamer, Oil

(Testimony of Arthur P. Knight.)

Well Supply Company, Limited, of Canada's 4½ inch underreamer, are pivoted at their upper ends on a pin which is slidably mounted in the key-ways on the extension of the body. A spring mounted in this extension operates through an intermediate pin to raise the cutters to uppermost [639] position. The lower end of this extension of the body has spreading-bearings which engage with bearings on the cutters to cause their expansion and contraction in their vertical movement, the upper ends of the cutters engage with thrust-bearings on the body and the lower portion of the cutters have inside bearings which engage with inside bearings on the extension of the body, but there are no means provided for lateral support or for outside bearings for the cutters. In a sense there is a hollow slotted extension at the lower end of the body, but not in the sense in which this expression applies to the Double reamer.

Q. 185. What features of the hollow slotted extension, as you conceive of it, in the Double underreamer, is lacking with respect to the hollow slotted extension of this exhibit?

A. The slotting of the extension so as to provide for projection of the portions of the cutters or slips through the sides of the extension while providing by such sides of the extension for engagement with the sides of the cutters for lateral support thereof.

If the Canadian reamer was provided with dovetail ways to coact with the cutters there would at least be still one important difference between that

(Testimony of Arthur P. Knight.)

reamer and the Double in that the spring-actuated means for raising the cutters in the Canadian is contained within the extension. With the Double only a portion of the spring-actuated means is always within the hollow extension.

Q. 188. And in the collapsion and expansion of the cutters of the Double patent reamer, a portion of the spring-actuated rod is always within the hollow slotted extension, is it not?

A. Yes, sir, but not the portion which co-operates with the spring, which must necessarily be of considerable length, in order to afford a spring of sufficient capacity for the work. This space for the spring in the extension of the exhibit does not permit of any spring of considerable length and capacity being used without [640] making an extremely long extension in the bits. Such long extension in the bits is not only objectionable in that it weakens the parts against endwise and transverse thrusts, but also diminishes to just that extent the inward and outward inclination for any given spreading action; so that, with such long cutters, it is not possible to make the cutters tilt at any decided inward angle or at any decided outward angle; whereas, with the short cutters of the Double and Wilson type the same amount of spreading motion will produce a greater angular deviation inward or outward, tending to free the cutters more effectively from the casing in passing into collapsed position, and to expand them more effectively, or at a more favorable angle, for cutting when expanded.

(Testimony of Arthur P. Knight.)

Q. 189. As between the Double patented under-reamer, of the patent in suit, and this exhibit under discussion, the tilt or swing of the cutters, as to the extent thereof, is a matter of degree, is it not?

A. The amount of linear motion inwardly or outwardly is a matter of degree depending on the size of the spreading-bearings and the position of the fulcra. Inasmuch, however, as the amount of space in a transverse direction is limited by the size of the casing through which the tool must pass, any construction which provides for greater angular deviation or throw of the cutters, with a given amount of linear spreading, relates to more than a mere matter of degree.

Cross-examination Resumed.

(By Mr. BLAKESLEE.)

Q. 190. When the cutters of the Oil Well Supply Company, Limited, of Canada's 4½-inch under-reamer are in contracted position, their cutting edges are in position to be withheld from the inner surface of the casing in passage through the casing, are they not?

A. I do not take it so, since these cutting edges are by measurement slightly further apart than any other part of the cutters, so that the collapsing action can only be effected by [641] engagement with the casing or shoe with these cutting edges; therefore, I do not see how these cutting edges can be swung clear of the casing.

Q. 191. I notice at the lower ends of these cutters embracing the cutting edges are dressed out, so as

(Testimony of Arthur P. Knight.)

to flare out at the cutting edges themselves. Isn't it a matter of dressing the cutters so as to permit them to clear the casing and shoe, what the overall width of the cutters is at the cutting edges?

A. Yes, sir, but I take it that the dressing out of the cutting edges of the cutters, as shown in this exhibit, is necessary for producing an effective cutting edge, in view of the great length of the cutters and a very slight outward inclination when expanded. It is necessary to have considerable clearance or cutting back of the cutters above their cutting edges so as to enable the cutting edges to bite or cut the rock, so that this dressing out appears to be a necessary feature.

Q. 193. There are upthrust receiving shoulders on the body of this reamer which co-operate with the upper ends of the cutters, are there not?

A. Yes, sir.

Q. 194. And the cutters of this reamer both tilt and also move lengthwise of the body and the extension at the lower end thereof, do they not?

A. They move lengthwise and they tilt slightly.

Q. 195. And these cutters have inwardly projecting shoulders at their inner faces, do they not, such shoulders co-operating with the lower end of the extension to cause the contraction and expansion?

A. Yes, sir, to cause the expansion and permit the contraction.

Q. 196. In your answer to Question 18, where on page 1532, you say, "The spreading-bearings at the bottom of the downward extension of the body hav-

(Testimony of Arthur P. Knight.)

ing been extended laterally so as to extend clear across the extension of the body," are we to take it that you [642] refer to "Defendant's Exhibit Double Underreamer" or "Complainants' Exhibit Double Underreamer"?

A. "Defendant's Exhibit Double Underreamer," I would say, however, that while these inclined faces are extended clear across, it is only that portion of them which lies within the limits of the shoulders on the cutters which is operative as a spreading-bearing.

Q. 197. And those are the portions lying within the confines of the large openings in the sides of the body, in which openings the cutters operate; is that not correct? A. Yes, sir.

Q. 198. Now, as far as the connection, mounting, and accommodation of the play of the cutters of Oil Well Supply Company, Limited, of Canada's 41½-inch reamer are concerned, that reamer has a hollow slotted extension at the lower end, has it not?

A. Not as far as the mounting and accommodation of the cutters is concerned.

Q. 199. Are not the cutters suspended or connected by parts projecting through a slot and entering a hollow in this extension of the body of this reamer?

A. Yes, sir.

Q. 200. And in that hollow there is a spring surrounded rod, the spring acting upon the cutters to urge them into expanded position, is there not?

A. Yes, sir. This spring surrounded rod, however, is in the extension and not in the body of the

(Testimony of Arthur P. Knight.)

reamer, as I have before pointed out.

The "Complainant's Exhibit Double Under-reamer," namely, the Double Improved Type, besides presenting the mode of operation set forth in the Double Patent, has an additional feature in the V-shaped notches at the lower ends of the side walls of the slipways, which are slightly above the corresponding faces on the [643] cutters. The lateral extensions on the cutters in this exhibit also engage with the surfaces on the body beneath these V-shaped notches.

Q. 204. And you are not prepared to say, are you, that such modified formation does not produce any better bracing effect against intrust on the cutters and against any rotative tendencies which may occur with respect to the cutters?

A. In view of the fact that the lower portion of the dove-tail bearings is cut away to form this V-shaped notch, and the fact that the dovetails serve to take rotative strain, I am not prepared to say that this lateral extension of the bearings is of any advantage in resisting rotative strain. It does, however, present a wider surface for the intrust; in other words, it makes the lower inside thrust-bearing wider, but does not change in any way its mode of operation.

Q. 205. And such variation of structure may assist in the opposition to rotative tendencies of the cutters, may it not, that is, rotative tendencies such as we have discussed in your previous examination?

A. If you consider only these flat faces, and leave

(Testimony of Arthur P. Knight.)

the dovetails out of consideration, the lateral extension of these surfaces will assist in the resistance to rotative strains; but, inasmuch as the dovetails are essential features of the device in each case, and these dovetails also take part of the rotative strain, I am certainly not prepared to say that there is any advantage in this respect, taking the construction as a whole, in widening out these bearings, inasmuch as the widening of the bearings necessitates cutting away of the dovetails.

I have never operated nor have I assisted in the operation of any type of an underreamer.

Q. 207. Have you ever made a study of the actual conditions attendant upon reaming by a study of underreaming operations and the [644] tools when withdrawing from the hole?

A. I have watched the underreaming operation as far as it could be done at the surface, and have seen the tools withdrawn; but have not seen enough of them to gain actual experience as to the effective underreaming operation of the tools.

Q. 221. Tilting is defined by a raising of a body at one side or end, whereas, rocking is more properly a swinging or turning movement, such as that both ends of the body partake of such swinging movement; thus, in the North patent, the two cutter jaws, which are pivoted on the cross-head on the rod, rock on each other at points of contact which are about midway between the upper and lower ends of the jaws, so that the upper ends swing inward about as much as the lower ends swing outward, this construction

(Testimony of Arthur P. Knight.)

being necessary with the North principle of operation in which the jaws are operated by engagement of their upper ends or shanks with the upwardly tapering socket. A tilting cutter, on the other hand, I take to be one in which the inward and outward motion is substantially at the lower end, the fulcrum of the cutter being near the upper end and the collapsing and expanding forces being all applied substantially below the fulcrum.

Q. 222. Within this distinction do not the cutters of "Complainants' Exhibit Double Patent" rock upon the fulcrum shoulders, 18, between the ends of the cutters?

A. Not in the normal working operation in collapsing or expanding when passing out of or into the shoe or casing, but under the special conditions I have before referred to, when there is an inward pressure on the lower ends of the cutters concurrently with a downward drag of the cutters relatively to the body, the cutters will fulcrum on the lower inside bearings and their upper ends will move slightly outward, while their lower ends move slightly inward.

Q. 223. And this latter motion will produce rocking of the cutters, will it not? [645]

A. There is a slight rocking under these conditions, yes.

Q. 224. North shows a rocking device for the special purpose of preventing such engagement of the cutters with the casing, and it is, therefore, a strong inference that without such locking device

(Testimony of Arthur P. Knight.)

such engagement would prevent downward movement of the cutters through the casing. If this locking device were removed the spring, c, would throw the cutters out into contact with the casing, and with the proportions of the parts shown the cutters would engage with the casing at points very slightly below their fulcrum on each other, with the result that in downward pressure on the cutters, in attempting to force the tool down in the well, the cutters would act as a spreading toggle forcing the rounded outer portions you refer to tighter and tighter against the casing. I don't see how, therefore, if North's locking device were omitted, the cutters could possibly be forced down into the casing.

Q. 225. The cutting edges of the cutters, however, could not engage with the inner surface of the casing in passing the underreamer through the casing downwardly with such rounded portions of the cutters in engagement with the casing, could they?

A. No, sir; but they are so slightly below such rounded portions that the amount of inthrow or clearance in any case would be very slight.

Q. 226. And a matter of degree, I take it?

A. Yes, but this is a case where a difference in degree makes all the difference between operativeness and inoperativeness.

Q. 227. There is no definite showing in this patent, is there, that the toggle or tongs would not be a collapsing one instead of an expanding one when lowered through the casing with the lower portions of

(Testimony of Arthur P. Knight.)

the cutters engaging the casing?

A. Taking into consideration the expanding action of the spring on the cutters and the obvious gripping tendency of the cutters on the casing, due to the slight angle they make with the [646] perpendicular to the casing, I consider that the showing in the patent is definite to the effect that if the locking device were omitted, and the jaws were allowed to come into contact with the casing, the engagement of the jaws with the casing would tend to produce further expansion rather than contraction.

Q. 228. That would depend upon particular determination of shapes and sizes, would it not?

A. As I have stated, the proportion and shapes of the parts in the North drawings are such that, in my opinion, there is no question but what this pinching or sticking action will occur in lowering the device through the casing if the lock were omitted, and I would not have to make any measurements to come to that conclusion.

Q. 229. The patent does not say so in the specification, does it?

A. I think that it does in effect in that it provides special means for preventing such contact.

Q. 257. Referring, now, to "Defendant's Exhibit U. S. O'Donnell & Willard Patent." Now, in the underreamer of "Complainants' Exhibit Double Patent," the cutters slide downward on the parallel flat faces of the extension, 6, in the first part of the collapsing action without any coengagement of the

(Testimony of Arthur P. Knight.)

shoulders, 18, with the spreading surfaces, 25, is that not so, in the same manner as you say the cutters of the O'Donnell & Willard patent slide downwardly at their inner faces on the outer faces of the partition, 3, in the first part of the collapsing action?

A. Not in the same manner, no, sir. In the O'Donnell & Willard patent this sliding action carries the cutters inwardly as well as downwardly, and is the main collapsing action, so that, when it has proceeded far enough, the cutters are collapsed or approximately so; whereas, with the Double construction, this first part of the action, consisting of the sliding of the cutters [647] downwardly, so that their bearings, 18, slide on parallel faces of the downward extension, is a direct downward movement without inward drift, and is not a part of the inward collapsing movement, but is a preliminary movement for bringing the inside thrust-bearings out of engagement, so as to permit of the subsequent collapse by riding over the spreading-bearings. In saying, therefore, that the manner of operation of the two underreamers is not the same in this respect, I mean that this sliding movement in the O'Donnell & Willard is the primary or proper collapsing action, whereas, in the Double underreamer it is simply preliminary to the proper collapsing action.

Q. 258. Now, the cutters of the O'Donnell & Willard patent reamer can never arrive at their final collapsed positions shown in Figure 1 until the lower portions of the cutters rock or tilt inwardly and the

(Testimony of Arthur P. Knight.)

upper portions of the cutters rock or tilt outwardly and away from the outer faces of the partition, 3, such rocking or tilting being on fulera at the lower portion of the partition, 3; is that not correct?

A. They certainly cannot assume the position shown in Figure 1 without rocking on the fulera at the lower ends of the partition; but whether they would be capable of entering the casing without assuming the position shown in Figure 1, would depend on the proportions of the parts. In this connection I will say that the proportions are not the same in Figures 1 and 3. With the construction shown in Figure 3 the cutters could slide down on the inclined faces of the partition until they are nearly collapsed; and in this position the cross-piece, 8, would be directly resting on the closed bottom portion of the partition, so that the cutters could swing inwardly under the inward pressure of the shoe; such inward movement, so far as it went, would be fulcrumed on the lower portion of the partition, which would, in this case, act as a fulcrum and not as a spreading-bearing. [648]

Q. 259. You are talking now of collapsion of cutters? A. Yes, sir.

Q. 260. Now, from that part of the specification embraced within lines 117 to 122, page 2, namely, "so that when the cutters 15 15' of the jaws engage with the shoe 22' the cross-head is free to slip in the stock, thus to allow the stock to be drawn up while the jaws collapse into the position indicated in the solid lines

(Testimony of Arthur P. Knight.)

in Fig. 1," do you not gather that the positions shown in the solid lines in Figure 1 are the positions which the cutters or jaws normally assume, within the disclosure of this patent, when in collapsed positions?

A. Not necessarily, for the reason, as before stated, that proportions of the parts in Figure 1 do not agree with the Figure 3; and for the further reason that the portion of the specification you refer to states that this position is "indicated in solid lines in Fig. 1 and in dotted lines in the upper position in Fig. 3"; and in this dotted position the parts are not rocked to any material extent, at least; very slightly as compared to the position shown in Figure 1.

Q. 261. But the specification of this patent goes on further to say, lines 1 to 5 inclusive, page 3, "The ends of the cross-head have sufficient play in their sockets to allow the jaws to swing freely toward each other as the shanks withdraw from the shank sockets." Does not this language imperatively imply and disclose a tilting movement of the cutters?

A. It implies a rocking movement of the cutters, but not necessarily a tilting movement. And to judge from the showing in Figures 1 and 3 the movement, such as it is, would be a rocking movement fulcrumed on the lower end portion of the partition, as distinguished from a tilting movement fulcrumed at the upper portion of the cutters.

Q. 262. Such a rocking movement, in other words, as occurs when [649] the cutters of "Complainants' Exhibit Double Patent," and "Complainants'

(Testimony of Arthur P. Knight.)

Exhibit Double Underreamer," and "Defendant's Exhibit Double Underreamer," rock upon the shoulders, 18, as fulera; is that not correct?

A. Yes, sir, under the special conditions I have before pointed out, but not under the normal working conditions in collapsing or expanding in passing through the shoe.

Q. 263. But under any conditions in which such play upon the fulera at 18 occurs; is that not correct?

A. That is right.

Q. 264. It is not customary, in preparing drawings for patent applications, to show the parts drawn to scale as in workings drawings, is it?

A. No, sir, but different views showing different positions of a given structure are supposed to conform approximately to the same relative dimensions.

Q. 265. But even in those instances scale plotting is not precisely followed, is it? A. No, sir.

Q. 266. And with the cutters in collapsed positions shown in Figure 1 in the O'Donnell & Willard patent, it would be necessary for them similarly to rock or tilt in a direction reverse of that, bringing them into collapsed positions, and upon the same fulera, in order that they may be drawn upwardly into expanded positions; is that not correct?

A. Yes, sir.

Q. 267. Now, the cutters in this O'Donnell & Willard patent have shoulders at their outer faces which engage with the shoe in the expanding and collapsing actions, have they not?

(Testimony of Arthur P. Knight.)

A. At the outer faces of the lower portions, yes; but not at the outer faces of the shanks. [650]

Q. 268. And will you please point out to me wherein, from considerations of operativeness, any locking device, such as the parts 16, 20 and 21, or any other locking device, is required in the use of an underreamer, such as is disclosed in this O'Donnell & Willard patent, in either the collapsion or expansion of the cutters or the lowering of the reamer through the casing, or the withdrawing of the reamer through the casing, or the use of the cutters with the same in expanded positions, any more than such locking device is necessary under similar conditions in the use of the Double underreamer? And in answering this question I wish you to state what those features are of the construction if disclosed in the O'Donnell & Willard patent, which necessitates the use of such locking device, if you find that there is such absolute necessity.

A. The principal feature in the O'Donnell & Willard underreamer which leads to the necessity of a locking device, or at least would interfere with successful operation without the use of a locking device, is the fact that the shanks of the cutters extend up within a bowl which is closed all around, so that the cutters cannot come into contact with the casing, or shoe except near their lower ends. This patent states that "It is to be observed in Figures 1 and 4 that the jaws are rounded, as at 29, so that the cutting edge of the jaws are inturned when the jaws are in

(Testimony of Arthur P. Knight.)

their down-drawn position, so that the cutting edges will not touch the casing during the descent of the tool." The patentees, therefore, recognize that the bearing of the cutters on the shoe will be on this rounded portion adjacent to the cutting edges, and the clearance or inthrow of the cutting edges away from the casing is simply that which is due to the small distance between this rounded bearing of the cutter on the casing and the lower cutting edge. The feature in the Double underreamer, as disclosed [651] in the exhibits referred to, which differentiates in this respect from the O'Donnell & Willard construction, is the provision of the slots or openings in the sides and of the downward extension of the body, through which portions of the shanks extend into contact with the casing at a considerable distance above the lower cutting edges, so as to give not only an enlargement or magnification of the inthrow or clearance by engagement of this bearing face with the casing, but to proportionately, or more than proportionately, increase the inward deviation or deflection of the cutters. It may also be stated that the rounding of the outer faces of the cutters, such as required in the O'Donnell & Willard underreamer, for any clearance at all, is not adapted to provide a good cutting edge, since it brings the outer faces of the cutting edges substantially vertical if not even in-turned, whereas, they project slightly outward in order to act as an efficient cutting edge.

Q. 269. Now, please state the function of the lock-

(Testimony of Arthur P. Knight.)

ing device disclosed in this patent, including the parts 16, 20, and 21.

A. The function of this locking device is stated to be "lock the cross-head against lowering"; and, again, to lock the cross-head against drawing out of the stock on the upstroke of the stock.

Q. 275. And with the elimination of such locking device would there be the elimination of any function necessarily entering into the operation of the cutters when expanded in reaming?

A. Possibly, yes. The patentees appear to depend on this locking device in part, at least, for retaining the cutters in expanded position, so that if it was removed I would not be prepared to say that the other instrumentalities would be operative without it for this purpose.

Q. 280. Whether the action of the cutters in the O'Donnell & Willard patent reamer, and the reamer in "Complainants' Exhibit Double Patent," is a rocking or tilting action, either one of these [652] actions causes a relative separation or approach of the cutting ends of the cutters, does it not, with an oscillation of the cutters causing such relative movement?

A. Your statement is correct except that the oscillation of the cutters in the O'Donnell & Willard underreamer is not the main factor in causing the inward and outward movement.

Q. 281. But such rocking of the O'Donnell & Willard cutters around the lower end of the partition, 3, is an oscillation within that broad meaning of the

(Testimony of Arthur P. Knight.)

term "oscillation" which likewise includes the expanding and contracting swinging actions of the Double reamer cutters; is that not correct?

A. So far as this action takes place, yes.

Q. 282. Now, the inner faces of the bowl at the bottom of the body of the O'Donnell & Willard patent reamer form outside thrust-bearings, do they not, for the cutters?

A. Yes, sir, but these outside thrust-bearings do not extend down at the sides of the cutters in the manner permitted by the slotted extension of the Double underreamer.

Q. 283. Nor in the manner in which the outside thrust-bearings extend in the Swan patent reamer; is that not correct?

A. In regard to the isolated feature of the outside bearings, without relation to the co-operation of the other parts, this is correct.

Q. 284. In "Defendant's Exhibit O'Donnell & Willard Patent," there is disclosed a body provided at its lower end with a hollow slotted extension, is there not?

A. In a sense, yes; but not in the sense in which I take this term to apply to the Double underreamer.

Q. 285. Is there not disclosed in the O'Donnell & Willard patent a hollow slotted extension, mechanically equivalent to the hollow slotted extension, 6, of Complainants' Exhibit Double Patent," irrespective of the slip ways, 9, in the latter patent, and the [653] openings between the slip ways?

(Testimony of Arthur P. Knight.)

A. This would only be a portion of the hollow slotted extension in the Double patent, but even this portion of what I term the transversely extending portion of the hollow slotted extension, or the downward extension, is provided with a feature which I do not find in the O'Donnell & Willard partition, namely, the spreading-bearings at the bottom of this member adapted to engage with inwardly facing bearings or shoulders on the cutters to tilt the same outwardly by a wedging action. I do not, therefore, regard these members as equivalents.

Q. 286. The lower end of the partition, 3, in the O'Donnell & Willard patent, and the lower end of the extension, 6, in the Double patent, are both rounded off so as to bulge downwardly, are they not?

A. Yes, but the rounded lower face of the partition in the O'Donnell & Willard patent has no apparent function to perform, as it does not co-operate with any part on the cutters; and therefore is not an equivalent of the rounded lower end of the transverse portion of the downward extension in the Double underreamer, which does so co-operate.

Q. 287. But as the inner faces of the cutters, of the O'Donnell & Willard patent reamer, rock away from the flat faces, at the sides of the partition, 3, do they not verge on to this rounded lower portion of the partition, 3?

A. Not perceptibly so, to judge from Figure 1; at any rate, only a very minute portion of this rounded face is utilized as a fulcrum or rocking bearing, and it is not utilized as a wedge or spreading-bearing.

(Testimony of Arthur P. Knight.)

In the O'Donnell & Willard underreamer patent there is a spring-actuated rod having a tee at the lower end which operates in the hollow slotted partition, 3, and suspends the cutters, the cutters being disposed at the sides of the partition, 3. The outer [654] faces of the partition, 3, serves as inside thrust-bearings for the cutters. There is possibly a small portion of the up-thrust of the O'Donnell & Willard cutters taken on the body where the partition, 3, joins the body. The main portion of the up-thrust, however, being taken at the shoulders 15, 15'."

Recalled.

Cross-examination Resumed.

(By Mr. BLAKESLEE.)

Q. 293. Do not the inner surfaces of the bowl or socket of the bottom portion of the body of "Defendant's Exhibit O'Donnell & Willard Patent Underreamer" coact with the shanks of the cutters of this reamer to produce the same out-thrust bearing results and the same results under corresponding conditions with respect to the oscillation of the cutters that the upwardly and inwardly inclined dovetails, at the lower end of the body of the reamer of "Complainants' Exhibit Double Patent," produce and perform?

A. Not quite. One reason for this difference in the operation being that in the O'Donnell & Willard patent the bearings, 15 15', are provided at the lower ends of the bowl for engagement with the cutters in

(Testimony of Arthur P. Knight.)

such manner that these bearings will take considerable of the oscillating strain. In respect to the purely operative strain, however, and leaving out of consideration the other functions of the dovetails, this surface of the bowl has a similar function in this respect to the inclined dovetails of the Double patent.

Q. 294. When, however, the outer faces of the shanks of the cutters of the O'Donnell & Willard patent reamer are in engagement with the inner faces of this bowl and any lengthwise movement is imparted to the cutters, an oscillatory movement is produced upon the cutters, is it not?

A. Possibly, although not necessarily so. If the lengthwise movement you refer to is directly upward at the cutting edges of [655] the cutters, then there will be an oscillatory movement tending to turn the cutters so as to cause their shanks to press outwardly on the inner faces of the bowl at the lower portions of the bowl, and tending to cause the upper ends of the shanks to press inwardly on the partition.

Q. 295. And if the lower portions of the cutters are in engagement at their inner faces with the partition, 3, and the upper portions of the cutters are in engagement at their outer faces with the inner surface of the bowl, and upward movement or downward movement of the cutters is produced, will not such oscillatory downward movement of the cutters take place in the O'Donnell & Willard patent reamer?

A. Not necessarily. For example, the parts in po-

(Testimony of Arthur P. Knight.)

sition shown in Figure 3 in which the shoulders on the cutters bear against a shoe at a point somewhat above the lowermost point of bearing on the partition, any movement of the tool upward from this position will cause the cutters to slide downwardly on the partition without any oscillation such as you refer to until the point of bearing on the shoe has passed below the point of bearing on the partition. After this point is passed there will be an oscillation or rocking motion.

Q. 296. I will call your attention to the statement of my last question which presupposed not the showing in dotted lines in Figure 3, but a condition in which the outer faces of the upper ends of the cutters were in engagement with the inner surface of the bowl. Now, under such circumstances, when the longitudinal movement is imparted to the cutters, either up or down, and the inner faces of the cutters at their lower portions are in engagement with the partition, will not such oscillation take place?

A. I was not referring to the position shown in the figure in the dotted line, but to the position shown in full line in that figure, wherein the upper portion of the shanks is in contact with the bowl and the lower portion in contact with the partition. [656]. Further upward movement of the shanks in this position is not possible, but further downward movement is possible, and only possible by sliding downward without oscillation, at least for the first part of the movement.

(Testimony of Arthur P. Knight.)

Q. 297. Yes, but that movement would not satisfy the conditions of my question, for, as I take it, consequent upon the initiation of such movement the outer faces of the cutters would immediately leave the inner surfaces of the bowl; is that not correct?

A. Yes, sir, if you mean to imply a condition in which the cutter shanks continue to maintain contact with the bowl at their upper portions and contact with the partition at their lower inner portions, such a condition would necessitate oscillation.

Q. 298. And in either upward or downward movement of the cutters that oscillation would occur, would it not? A. Yes, sir.

Q. 299. Now, please refer to "Complainants' Exhibit Double Patent" and "Defendant's Exhibit O'Donnell & Willard Patent," both, and state whether or not the following language is not definitive of the disclosures of both of said patents, to wit: An underreamer having a body provided at its lower end with an extended portion having an internal hollow extension longitudinally or axially of the body, and having likewise a transverse slot cutting such hollow, a part playing vertically in the slot, a spring-actuated rod playing vertically in the hollow and extended upwardly into a hollow in the body and carrying the last named part playing in the slot; cutters suspended at either side of the said hollow slotted extended portion and connected with the part playing in the transverse slot, the lower end of said extended portion being rounded off to produce surfaces at which the cutters oscillate

(Testimony of Arthur P. Knight.)

on fulcra intermediate of their ends and at their inner surfaces; upthrust bearings upon the body co-operating with the upper ends of the cutters, the extended portion intermediate of the cutters acting as [657] an inthrust bearing for the cutters; means outwardly of the cutters and co-operating with the shanks of the cutters to confine the cutters to zones of oscillation and longitudinal play, such latter means acting as outthrust bearings; and shoulders upon the cutters at their outer faces with which the shoe or bottom of the casing co-operates in producing and aiding the expansion and contraction of the cutters; the cutters being raised when in expanded positions and lowered when in contracted positions.

A. Your definition implies that there is a co-operation between these different elements; and, therefore, that the oscillation you refer to is produced or producible by engagement of the shoulders you refer to with the shoe. In this respect I consider the definition unfortunate as a comparison of the two reamers, as the engagement of the shoe with the Double reamer does not result in an oscillation in which the lower portion of the extension you refer to is used as a fulcrum, whereas, in the O'Donnell & Willard this action does occur to a limited extent at the lower portion of the stroke.

Q. 300. Now, if I eliminate from the statement in the question any such implication as you have raised in your last answer, is the statement in the question definitive of the structures of both the

(Testimony of Arthur P. Knight.)

O'Donnell & Willard and Double patents?

A. Eliminating any implication as to the mode of operation and principle of action of the parts, would say that these details or elements of construction as so defined may be found in each of these exhibits.

Q. 301. And as to the mode of operation and principle of action of these features in both structures, have you anything further to add to your previous testimony or may your previous testimony be considered without further additions as pertinent to such structures and the modes of operation and principles of action thereof? [658]

A. I think that I have already pointed out sufficiently the differences in the mode of operation and principles of action of these underreamers. These may, however, be summed up in a few words. The Double underreamer cutters, in co-operation with the shoe, in the collapsing operation, first ride down to bring their inside thrust-bearings out of coengagement and then ride in on the spreading-bearings so as to tilt or swing inwardly substantially at their lower ends without substantial movement at their upper ends. The O'Donnell & Willard cutters, when co-operating with the shoe in collapsing operation, initially slide obliquely inward and downward, then rock on fulcrum near their lower ends. The function of the spreading-bearings of Double patent not being found, in my opinion, in this O'Donnell & Willard underreamer. These differences have relation to the actual modes of operation of the parts you have specified. Other differences in the

(Testimony of Arthur P. Knight.)

mode of operation and principle of action depend on parts which you have not specified in your question, namely, the slotted dovetail portions in the extension through which the shanks of the cutters project into engagement with the casing for producing the effective bearing high up on the cutters while maintaining the lateral and outside bearings for the cutters at a relatively low point, thereby providing in one and the same underreamer for an enlarged collapsing action by the high outside bearing of the cutters and an effective lateral and outside support by the bearings on the downward extension at points below said outside bearings of the cutters. The O'Donnell & Willard patent does not show these dovetail slotted slipway portions.

Q. 302. Now, I take it that with these distinctions made as between the disclosures of the O'Donnell & Willard patent and the Double patent in suit, the statement of my long question, No. 299, definitive of the disclosures of both patents, is correct, is it not? [659]

A. Bearing in mind these distinctions, the statements you made are, in terms, correct.

Q. 303. Now, as between the disclosure of "Complainants' Exhibit Double Patent" and the disclosure of "Defendant's Exhibit O'Donnell & Willard Patent," do you find any difference dependent upon omission in the O'Donnell & Willard structure of features, which, I take it from your testimony, are important in the construction and operation of the Double structure, further than the inwardly pro-

(Testimony of Arthur P. Knight.)

jecting shoulders, 18, upon the inner faces of the cutters of the Double reamer, and the slipways, 9, of the Double underreamer in pairs and separated as to the slipways of each pair by a slot permitting projection of the cutters through the slots and outward thereof, of course including the dovetails upon the cutters of the Double underreamer which co-operate with the slipways?

A. If by the shoulders, 18, you intend to refer to the parts of the Double underreamer which produces spreading action, including, therefore, the portions on the extension of the body, and the shoulders on the cutters which ride on one another, to produce the collapsing and expanding action, I take it that the features you refer to are the important features of distinction.

Q. 304. Now, as to the slotted sides of the body in themselves permitting projection of the cutters beyond the periphery of the body, do you not find these in "Defendant's Exhibit U. S. Deisch Patent?"

Mr. LYON.—Objected to as irrelevant and immaterial if the question is intended to import any adding of such feature to the showing of the O'Donnell & Willard patent as it is a process of modification, rearrangement, and reorganization, of the prior art in relations and in combinations and in modes of operation not shown in fact to exist in such prior art; therefore, solely and simply a hypothetical rearrangement, reorganization, and combination, and a purely theoretical one. [660]

Mr. BLAKESLEE.—On its face the question con-

(Testimony of Arthur P. Knight.)

cerns application of the prior art to the alleged invention of the Double patent in suit.

A. Not in the sense which I have referred to the function and advantage of this construction, inasmuch as the cutters in the Deisch patent can only engage with the casing or shoe at their lower cutting edges, so that the beneficial effect of this projection of the shanks of the cutters through the slotted slipway, in enlarging the inthrow of the cutters and throwing the cutting edges clear of the casing, is not found in the Deisch patent.

Mr. BLAKESLEE.—We move to strike out the last answer of the witness as not responsive to the question and will ask him to kindly confine his answers to yes or no, particularly respecting the exact language of the question and not going further into reconsideration of the Deisch patent as to anything *de hors* the question.

A. Please read the question. (Last question read.) As an isolated feature, yes.

Q. 305. It is a feature involved in the operation of the reamer disclosed in the Deisch patent, is it not?

A. Yes, sir.

Q. 306. Now, likewise, in "Defendant's Exhibit Swan Patent," do you not find slots at the sides of the lower end of the body through which the cutters project outwardly of the periphery of the body, there being slipways at the sides of the slots, with which slipways the cutters co-operate in their expansion and contraction?

A. Yes, but the effect of the projection of the cut-

(Testimony of Arthur P. Knight.)

ters through the slots at the sides of the Swan underreamer is not to permit or to produce any tilting action of the cutters so as to enlarge the inward movement of their cutting edges.

Mr. BLAKESLEE.—We move again to strike out the last answer [661] of the witness as not responsive to the question, and will ask him to answer the question yes or no purely on the statement of the question itself.

(Last question read.)

A. As a definition of construction without regard to function, yes.

Q. 307. And the construction so defined in the last question enters into the operation of the reamer embodying such construction, does it not?

A. Yes, sir.

I also find in the “Defendant’s Exhibit U. S. Allen Patent” an underreamer having cutters having longitudinal movement and oscillation in their expanding and contracting actions and provided at their inner faces with inwardly projected shoulders co-operating in such expansion and contraction with an intermediate spreading member. The inwardly projecting shoulders also engage with the intermediate spreading member which serves as an intrust bearing while in operation, so far as I can make out from the specification or drawings.

Also in referring to “Defendant’s Exhibit U. S. Yorke Patent” I find an underreamer having swinging cutters having inwardly projecting shoulders at their inner faces co-operating with an interposed

(Testimony of Arthur P. Knight.)

member acting as an inner thrust-bearing when the cutters are expanded.

Q. 311. Referring now to "Defendant's Exhibit Figure 2161, Oil Well Supply Company's Catalog of 1900," as far as you can make out any of the features thereof from this cut, unaided by specific instruction as to its disclosure, do you note any feature thereof tending to render the structure so disclosed inoperative?

A. As far as I can make out from this disclosure, there does not appear to be any means for supporting the downwardly and outwardly extending members at the bottom which I take to be cutters, [662] and in default of any such means I should not consider the device as operative.

Q. 316. The inner faces of the cutters of "Complainants' Exhibit Wilson Underreamer," "Complainants' Exhibit Wilson Underreamer No. 2," between the planes of the sides of the shanks of the cutters, are devoid of inwardly projecting shoulders in the same sense that the similar parts of the cutters of "Defendant's Exhibit O'Donnell & Willard Patent" are devoid of such inwardly projecting shoulders; is that not correct?

A. At these portions, yes.

Q. 320. Now, in "Defendant's Exhibit O'Donnell & Willard Underreamer," are not the upper ends of the cutters disclosed to fit up against the body, or the partition which screws into the body, when the cutters are in expanded positions? A. No, sir.

Q. 321. Then, in this respect this O'Donnell &

(Testimony of Arthur P. Knight.)

Willard reamer does not follow the disclosure of the drawing of the O'Donnell & Willard patent; is that correct? A. Yes, sir.

Q. 322. Now, as you have used the terms "rocking," "tilting" and "teetering," in your testimony, does not the term "oscillating" generically and broadly include in its meaning such three terms?

A. Possibly, although the term oscillating refers to a number of back and forth movements, whereas, the other terms not necessarily so; however, in this particular application it probably does.

The term "oscillating" as applied in my testimony probably has broadly the same meaning as the terms "rocking" "tilting" and "teetering."

Q. 323. Referring to Complainants' Exhibit Double Underreamer with Enlarged Slot," do you find at the lower end of the body both the keyway for the cutter holding key and the hollow as [663] separately defined spaces, the hollow providing a close working fit for the spring-actuated rod?

A. No, sir, not as separate spaces and not forming a close fit for the rod, as stated.

Q. 324. As a matter of fact, in this exhibit is not the hollow all gone and do not the spring-actuated rod and the key both move in one continuous opening?

A. I would not say that the hollow was all gone, but it is merged with the slot in a continuous opening.

Q. 325. And it is more of a hollow than it is a slot, that is, this space, is it not?

(Testimony of Arthur P. Knight.)

A. If you are referring to the entire open space, I would say that it is just as much a slot as it is a hollow.

Q. 326. But does not your own language, "one open space," better fit this opening than any other language?

A. No, sir, I think that the terms "hollow," or "hollow slot," or "hollow slotted part," are just as correct.

Q. 327. But it is just one open space, is it not?

A. Yes, sir.

Q. 328. Now, if you removed from "Complainants' Exhibit Double Patent" all of the extension, 6, being that part at the lower end of which are formed the spreading surfaces, 25, would the cutters expand and contract, and would the reamer be operative?

Mr. LYON.—The question is objected to as indefinite in that it does not appear therefrom how much counsel included in this question, in his understanding thereof, by the term "extension 6."

A. If these spreading-bearings were totally removed and eliminated from the tool, the device would not, in my opinion, be operative.

Q. 329. (By Mr. BLAKESLEE.) Do you find in "Complainants' Exhibit Wilson Underreamer," or "Complainants' Exhibit Wilson Underreamer No. 2," a mandrel or body having a downward extension, having [664] opposite parallel bearing faces, having a key-way therein, and upwardly and inwardly sloping dovetail slipways, there being

(Testimony of Arthur P. Knight.)

shoulders at the sides of such extension?

A. I do not find in these exhibits this exact construction word for word, but I do find the equivalent thereof.

Mr. BLAKESLEE.—We ask that the last portion of this answer beginning with the words “but I do find” be stricken out as not responsive to the question, and merely volunteered surplusage.

Q. 330. Do you find in either of these exhibits a spring supported rod, slips, and a key carried by the rod and carrying the slips? A. Yes, sir.

Q. 331. Please point out the key.

A. The so-called cross or head at the bottom of the rod I consider a key; it is not a removable key, but it is a key.

Q. 332. Do you find in either of these exhibits tilt slips furnished with inward projections at their inner faces? A. Yes, sir.

Q. 333. Do you find such inward projections to project inwardly of the planes of the inner faces of the slips?

A. There is no one plane constituting the inner face of the slips, there being one plane constituting the inner face of the shanks, another plane constituting the inner face of the cutting portions, and another plane which is beyond the last named plane and outwardly from the inner plane of the shanks.

Q. 334. Do you find such inward projections as lying inward of the planes of the inner faces of the shanks? A. No, sir.

Q. 335. Do you find in either of said exhibits a

(Testimony of Arthur P. Knight.)

yieldingly supported rod furnished with a key seat, and a notched key in the key seat of the rod, a portion of the rod taking into the notch of the key?

A. No, sir. [665]

Q. 336. Do you find in either of said exhibits tapering dovetail slipways?

A. No, sir, not as an isolated element.

Q. 337. And not as an element so specifically designated, do you? A. No, sir.

Q. 338. Do you find in either of said exhibits a hollow slotted extension having opposite parallel bearing faces? A. Substantially, yes.

Q. 339. Exactly? A. Not absolutely.

Q. 340. And those faces referred to as not absolutely parallel are the faces, 9, disclosed in "Defendant's Exhibit Wilson Patent," are they not, those faces being upwardly divergent?

A. Yes, these are the faces and they are slightly upwardly divergent.

Recalled.

Redirect Examination.

(By Mr. LYON.)

Q. 341. On cross-examination your attention has been directed to certain changes which appear in "Complainants' Exhibit Double Underreamer" from the device shown and described in the Double patent in suit. What difference, if any, in the mode of operation or the principle of co-operation of the bits and body portion in the collapsing or in the expansion of the bits to and from reaming position, has been effected or made by any difference in con-

(Testimony of Arthur P. Knight.)

struction of such so-called new styled Double underreamer, "Complainants' Exhibit Double Underreamer," from the Double patent construction?

A. These changes in the construction have not made any difference in the mode of operation or principle of action of the parts in collapsing and expanding. The tilt slips working on the downward extension of the body and co-operating with the bearings [666] thereon for expansion and contraction in the same manner and according to the same principles of operation in "Complainants' Exhibit Double Underreamer" and in "Complainants' Exhibit Double Patent."

Q. 342. And what change in such mode of operation, principles of action, or interrelation of the parts, in either collapsing or expansion, has been effected by the removal of the metal in "Complainants' Exhibit Double Underreamer with Enlarged Slot?"

A. There has been no change in the principle of action, the change resulting simply in decreasing the amount of the bearing surface, but the bearing surface is remaining and performing the same functions and acting in the same manner as before.

Q. 343. What difference, if any, is there in the mode of operation, or principle of action, or interrelation of parts, of the Wilson underreamer, bits and body, in either collapsing or expansion, due to the use in the Wilson underreamer of an integral key or T, as compared with the spring-actuated rod and key of the Double patent in suit and the bits and

(Testimony of Arthur P. Knight.)

body portion thereof?

A. As far as the functions of the parts in expanding and collapsing are concerned, the cross or T on the lower end of the spring-actuated rod in the Wilson underreamer, acts in the same way as the key on the spring-actuated rod of the underreamer shown in 'Complainants' Exhibit Double Patent.' In this connection I call attention to the following language in the Double patent: "The key 17 thus forming a portion on the rod 11 on which the tilt slips or bits 15 are loosely swung or pivoted," showing that in this patent it is recognized that the key while removable does, in action, form a portion of the rod.

Q. 344. On cross-examination, you have stated that in both the Double underreamer and in the Wilson underreamer, when the cutters or bits are in expanded position, they are in fixed position in the extension, and that the mode of operation of the parts is precisely [667] the same and their bearings the same; and you have referred to the fact that the bits slide longitudinally down in collapsing or moving relatively to the body. Would you say that in this motion the action of the bits of the Wilson and Double are substantially equivalent or substantially different?

Mr. BLAKESLEE.—Objected to as leading.

A. I would say that in the normal collapsing and expanding operation in passing into or out of the shoe, the action of the two bits is substantially the same, while in collapsing under the special condi-

(Testimony of Arthur P. Knight.)

tions I have before referred to, where the lower ends of the bits or cutters are pinched toward one another while a drag is exerted thereon tending to pull the same downward in the extension of the body, the action is equivalent in the two bits referred to.

Q. 345. (By Mr. LYON.) Referring now to "Defendant's Exhibit Mentry Patent," I note that, while you were discussing this patent, you did not in a general way state any conclusion as to the comparison of the mode of operation or principle of action of the parts as compared with the Double underreamer patent in suit or the Wilson underreamer. Please do so.

Mr. BLAKESLEE.—Objected as not proper re-direct examination.

A. The mode of operation of the underreamer shown in this Mentry patent is different from that of "Complainants' Exhibit Double Patent" in that the Mentry underreamer does not provide for tilting of the cutters as they expand or collapse, nor does it provide for engagement of the cutters with the casing or shoe at points considerably above the cutting edges so as to throw the cutting edges inwardly clear of the casing. The principle of action and mode of operation of this Mentry underreamer are, therefore, different from the Double underreamer.

Q. 346. (By Mr. LYON.) In your answers, either on direct or on cross-examination, with reference to "Defendant's Exhibit Kellerman [668] Patent," you have discussed more or less in detail the con-

(Testimony of Arthur P. Knight.)

struction and principles of operation of the disclosure of this exhibit. Will you state what you find in this Kellerman patent as the mode of operation and principle of coaction of the parts in collapsion and expansion as compared with the Wilson and Double underreamers?

Mr. BLAKESLEE.—Objected to as not proper redirect examination.

A. The principle of action of this Kellerman underreamer is that of a spreading wedge which is movably mounted and is forced up between tilting cutters, which are held from vertical movement relatively to the body of the tool; and the mode of operation of this underreamer requires, for the release of the cutting wedge from the cutters, the use of some special device, namely, the pipe, H, and its accompanying parts, for holding said wedge down while the tool is drawn up so as to allow the cutters to pass off of the spreading wedge, in distinction to the mode of operation of the Double underreamer in which the movement of the cutters relatively to the wedge is secured by the pressure of the shoe or casing on the outer faces of the cutters. The mode of operation and principle of action of this Kellerman underreamer are, therefore, distinct and different from the mode of operation and principle of action of the "Complainants' Exhibit Double Patent."

Q. 247. (By Mr. LYON.) On cross-examination you have stated that the locking device shown in "Defendant's Exhibit O'Donnell & Willard Pat-

(Testimony of Arthur P. Knight.)

ent'' could be eliminated without elimination of any function necessarily entering into the collapsing of the cutters or jaws, further than permitting such collapsion, or any function necessarily entering into the expansion of the cutters or jaws. Assuming that an ordinary skilled mechanic had never seen or heard of, and had no knowledge of, either the Wilson or the Double underreamers or patents and had prior to the date of Mr. Edward Double's [669] invention, placed before him the drawings and specification of said "Defendant's Exhibit O'Donnell & Willard Patent," in following the teachings of such O'Donnell & Willard Patent'' to build an underreamer, what would such O'Donnell & Willard patent present to and guide such mechanic in making?

Mr. BLAKESLEE.—Objected to as not calling for the best evidence, the patent itself being manifestly the best evidence as to the construction and interrelation and offices and functions of the parts thereof; and furthermore as being a mere hypothetical question based upon a postulate which has nothing to do whatsoever with the comparison of exhibits in this case; and furthermore as calling for a mere expression of idle opinion upon the part of the witness who has not even qualified as a practical expert in the oil-well tool art, either as to the construction or operation of oil-well tools of any kind and description. And the further objection is made that the best evidence as to the disclosure of this O'Donnell & Willard patent and as to any bearings

(Testimony of Arthur P. Knight.)

of such disclosure, is the given testimony of the present witness and other witnesses as to such disclosure. And the further objection is made that it is not proper redirect examination.

A. The disclosure in this patent is such that any skilled mechanic, constructing the underreamer in accordance with the drawings and description of the patent would, as a matter of course, include in the construction each and all of the operative features disclosed in the patent, including the locking device, and there is nothing in the disclosure which would lead him to omit such locking device or to regard such locking device as unnecessary, but rather the contrary.

Q. 348. In your answer to Question 64—which was, “Do you find anywhere in the specification of this patent (“Complainants’ Exhibit Double Patent” in suit) any reference to the shoulders, 8, or the slip ways, 9, or either of them, as being part of the [670] extension, 6?”—You referred to lines 50 to 55 of page 1 of the Double specification. Is there any other reference in this specification thereto?

A. Yes, the words in lines 92 and 94, “The slips 15 are slidably mounted on opposite sides of the downwardly-extending portion of the mandrel. . . .” In order that any part shall be mounted on another, means must be provided for retaining it in mounted relation; and these retaining means are therefore necessarily parts of the downwardly extending portion of the mandrel. These means for

(Testimony of Arthur P. Knight.)

retaining the slips in mounted relation on the downward extending portion of the mandrel are constituted by the slipways, which, therefore, according to this language, belong to the downward extension of the mandrel or body.

Q. 357. You have received or are to receive by agreement compensation for your services as expert on behalf of complainants in this suit, are you not?

A. Yes, sir.

Q. 358. Now, does not the key of "Complainants' Exhibit Double Patent," namely, the key, 17, constitute an adjunct of the spring-actuated rod within a more proper definition than were it defined as a portion of such rod?

A. This definition of the key as a portion of the rod which is given in the Double specification is, in my opinion, a proper one, considering the key in its proper function in relation to the bits or cutters; and just as proper, in my opinion, as it would be to call the key an adjunct of the rod.

Q. 359. Is this key of the Double spring-actuated rod as properly a portion thereof as the integral T of the Wilson spring-actuated rod?

A. As far as its proper function in collapsing and expanding action of the cutters is concerned, yes.

Q. 360. How about its physical participation in the construction [671] of the spring-actuated rod?

A. Its physical construction with relation to the spring-actuated rod is different.

Q. 361. And you would respect such difference,

(Testimony of Arthur P. Knight.)

would you not, in describing it specifically in a specification for application for letters patent?

A. Specifically, yes.

If you had a fixed T-Head at the lower end of the spring-actuated rod of the Double underreamer, you could not assemble the spring-actuated rod and cutters in the manner disclosed in the Double patent.

Q. 362. Now, if you had a fixed T-head on the lower end of the spring-actuated rod of the Double underreamer, you could not assemble the spring-actuated rod and cutters in the manner disclosed in the Double patent, could you?

A. No. As I have already testified, with respect to the manner of the assembling of the parts, and the way in which this key member or portion is provided on the rods, and the provision of the separable key member in the Double underreamer, as a specific function involving its separability, and in this connection the separability of the key is a feature of the Double patent, but not with respect to its working function when once the parts are assembled.

**Testimony of Robert E. Bole, Witness Called on
Behalf of Complainants in Rebuttal.**

Mr. Bole testifies as follows:

I reside in Los Angeles, California. Occupation Oil Well Pump Manufacturer. I have been connected with the Wilson & Willard Manufacturing Company having been a machinist in their employ possibly two years ago. I worked on Wilson underreamers and am [672] familiar with them.

(Testimony of Robert E. Bole.)

Have seen Wilson underreamers in the shop of the Wilson & Willard Manufacturing Company for repairs.

Q. 8. What was the nature of the breakage or fault for repair?

A. Well, there were different kinds of repairs. The repairs on these kind of reamers were principally cutting them back or worn dovetails; and there were other reamers that were sent back to be cut back, if they could be used, and, if not, they were scrapped. They were a different kind of reamer than either of these two. Some of them did not have holes drilled in the bottom for the safety bolt. Those that did not have holes for the bottom bolt were broken off across the shank usually, just one wing broken off. Mr. E. C. Wilson told me that he would make no more Wilson underreamers without the safety bolt, because they broke at the shank in the manner described. I think it was the outward thrust on the cutters that breaks the shanks of the body.

A. 22. Well, there are, in a reamer, I should say, three different thrust-bearings; and one is up in the shank, here; another, against the dovetails on the inside, which is an outward thrust; and the other on the bearings here, which is an inward thrust. One is an inward thrust, one an outward thrust, and the other an upward thrust, and the outward thrust would be the one that would break the shank, because it would—at the same time it is an outward thrust on the cutters, it is an outward thrust on the

(Testimony of Robert E. Bole.)

prongs, and the wear on the prongs and wear on the dovetails would indicate that that was the case.

I helped to assemble the 10" O'Donnell & Willard Underreamer. I don' remember much about the making of it. The reamer was sent to Coalinga. It was sent to the American Petroleum Company at Coalinga.

Q. 26. Have you any knowledge as to any attempted use, or use, of it at the Octave Oil Company?

A. Yes. I believe they tried to run it and could not get it in the hole. [673]

Q. 27. Was there anything done with the reamer after that?

A. Well, there was something done to it. I have forgotten as to whether it was in a try-out before they shipped it up there or after they sent it back; but there was a change made in it. I think it was after it came back.

Q. 28. And, in a general way, can you explain what that change was, what it referred to?

A. Yes. They put a sort of a prong, pair of prongs, on the bottom a catch, like the end of the Wilson reamer. It seems that the cutters wouldn't open going in the casing, wouldn't allow the reamer to go in the casing, and by putting the prongs on it would retain the cutters right as it was drawn down and allow them to ride in the casing on their own shoulders.

It was tried after that on the American Petroleum Company's property. The reamer was badly dam-

(Testimony of Robert E. Bole.)

aged and I should say was beyond repair when I saw it.

Q. 33. Do you know what became of the reamer?

A. Yes. The reamer was cut up and made into a combination-socket.

Q. 34. By "combination socket," what do you mean?

A. A combination socket is a tool used to fish out of a hole lost fishing tools—or lost drilling tools. It has slips in the bottom to take hold of the lost article.

Q. 35. This underreamer that was used by Tom Crampton on the American Petroleum Company property at Coalinga was the same reamer that you assembled in the Wilson & Willard Manufacturing Company's shop?

Mr. BLAKESLEE.—Objected to as leading.

A. Yes.

Mr. LYON.—You may inquire. [674]

Cross-examination.

(By Mr. BLAKESLEE.)

Q. 36. Did you see this 10-inch reamer cut up and made into a combination socket? A. No, sir.

Q. 37. What do you know, of your own knowledge, about its being made into a combination socket?

A. I don't know. Mr. Crumpton told me that.

Mr. BLAKESLEE.—We, therefore, move to strike out all that portion of the answers of the witness relating to any cutting up of this so-called 10-inch reamer, and its alteration or transformation into a combination socket, or anything else, on the

(Testimony of Robert E. Bole.)

ground that the witness has not testified of his own knowledge, and it is merely hearsay.

Q. 38. Do you know anything personally of the use of this so-called 10-inch reamer by the American Petroleum Company?

A. That is, seeing it operated?

Q. 39. Of your own personal knowledge, outside of what somebody may have told you, or you may have heard?

A. No, just saw it lying on the platform of the American Petroleum Company's warehouse.

Q. 40. And where was that?

A. At Coalinga.

Q. 41. Did you ever see it at any place other than that platform or at the shop of the Wilson & Willard Manufacturing Company in Los Angeles?

A. Yes, saw it on the Octave Oil Company at Coalinga.

Q. 42. And where was it there?

A. I was demonstrating it to the superintendent there, Mr. Lehman.

Q. 43. How were you demonstrating it?

A. I took it apart and put it together, showing how to do it. [675]

Q. 44. You did not operate it in the hole, did you?

A. No.

Q. 45. Did you ever see it operated in the hole, or were you ever present when it was operated in the hole? A. No.

Q. 46. Outside of what people have told you, do you know anything about this 10-inch reamer, which

(Testimony of Robert E. Bole.)

you would swear to as being your own knowledge, other than you saw it assembled or assisted in assembling it in the shop of the Wilson & Willard Manufacturing Company, and saw it on the platform at Coalinga, and demonstrated it to Mr. Lehman at the American Petroleum Company property?

A. I would not know if you would call it an operation, or not, to see a reamer tested on the floor. We tested the reamer in running it in and out of casing on the floor in the shop. Outside of that there is nobody, unless you would go down in the ground, could see a reamer in operation, see it running in and out of the hole but not working.

I don't think those prongs I speak of were later added to that reamer had anything to do with the working purposes of the reamer. They were simply put there to allow the reamer to go into the hole. They were on the side ends of the partition. There was a bottom end to the partition, and those two prongs would be on the side ends. My recollection is that these prongs were riveted on to the partition. I cannot say where the Wilson underreamers without the safety bolts were shipped to but I know they did come back for repairs. They were re-machined or machined over.

I have recently been in litigation with the Wilson & Willard Manufacturing Company. Same was in regard to my account with them.

I cannot say positively where any of the Wilson underreamers which had broken prongs came from.

(Testimony of Robert E. Bole.)

I saw them in the yard of the Wilson & Willard Manufacturing Company. I never saw them anywhere else. I do not know how they were broken, but I imagine [676] they were broken by the outward pressure on the prongs. I don't know whether it was done in the well or out of the well. I would say that there were at least five but not any more. They were all at the shop of the Wilson & Willard Manufacturing Company. When Wilson reamers are re-machined they are in a condition to be used again, yes. About two years ago they commenced re-machining Wilson reamers. Reamers that had been in long service were made over by the Wilson & Willard Mfg. Company by re-machining. I have sold Wilson underreamers for the Wilson & Willard Mfg. Company, commencing to sell them in about 1908. While I was doing business with the Wilson & Willard Mfg. Company concerning my Pump I was on very close relations with Mr. Willard and Mr. Wilson. I made headquarters in their office. I had the freedom in their office. Upon settling my accounts with them very considerable friction resulted between myself and Mr. Wilson.

Q. 126. Now, with reference to this breakage of the bodies of the Wilson underreamers on what might be termed the prongs, and just about the line of the upper thrust-bearing in the process of the manufacture of the Wilson underreamer, what liability is there of breaking such Wilson reamer at this point in the manufacture?

A. I would not consider there was any liability of breaking.

(Testimony of Robert E. Bole.)

Q. 127. Did you ever know of one being broken at this point during the manufacture? A. No, sir.

By Mr. LYON.—Complainant offers in evidence certified copy of file wrapper and contents of the application upon which Defendant's Exhibit Wilson Patent #827,595, was issued; and the same is marked "Complainants' Exhibit File Wrapper Contents."

And complainant offers in evidence copy of patent #819,042 dated May 1st, 1902, to Alexander Cummings; and the same is marked [677] "Complainant's Exhibit Cummings Patent." The Cummings Patent being offered in evidence in connection with said file wrapper exhibit and being the Cummings patent referred to therein.

By Mr. BLAKESLEE.—We object to the offer of these exhibits, first, on the ground that the time for taking rebuttal proofs or offering rebuttal proofs of this nature has long since passed, the stipulation between the parties extending the time therefor being only for a period of five weeks from the 18th of January, 1913, with the exception of such extensions as have been made by agreement in connection with the taking of proofs subsequent to that period of time. And counsel for complainants some two weeks ago notified defendant that the defendant's proofs would be concluded upon the taking of two further depositions only. The further objection made is that the exhibit, insofar as pertinency to the issue, or any of the issues, is concerned, is irrelevant, immaterial and incompetent. Defendant's

(Testimony of Robert E. Bole.)

Exhibit Wilson Patent coming before the court in these proceedings for consideration only upon its face, and no issue being presented which brings before the court for consideration any of the antecedents of this Wilson patent or any of the proceedings leading to its issue; and as far as these proceedings are concerned its validity can only be considered upon its face. As to this objection, attention is called to the court that before this same court is now pending an action against the complainant corporation, the Union Tool Company, for infringement of the said Wilson letters patent, in which suit all questions concerning and affecting this Wilson patent and its validity and scope and pertinent otherwise may be considered and determined; such suit having been filed on or about February 15, 1913.

It is agreed between counsel for the parties that the proofs, on behalf of both parties, are now concluded; and the Special Examiner is requested to certify his report to the court. [678]

Testimony of W. O. Clay, for Defendant.

W. O. CLAY, being called as a witness on behalf of defendant, testifies as follows:

My name is W. O. Clay, and am superintendent of the Section 25 Oil Company; age, 48; resident of Taft. Have been in the oil business about twenty-five years having worked in Pennsylvania and California. Also operated in Ohio. I have used underreamers and am familiar with them.

A. 11. Well, I never used an underreamer much

(Testimony of W. O. Clay.)

until I came to California. Never had occasion to use them very much.

Q. 12. Please state why you did not have occasion to use one before.

A. Well, we never had occasion there like we did here. We always drilled an open hole.

Q. 13. For what reason was it an underreamer was not required in drilling an open hole.

A. For the simple reason we had no casing to put in. In other words we drilled an open hole. We did not put casing in as the formation stood up. The first underreamer I had any experience with was the Wilson underreamer. I think it was in 1908. As a rule the Wilson reamer has given good satisfaction.

Have also used the Double. I have also had good success with the Double. When reamers go into the hole you are bound to have trouble with any of them. I have lost the lower part of a Double underreamer in the hole.

A. 30. It was caused by the men on the well on which the loss occurred. It was not set up correctly and it unscrewed.

Q. 31. Where did the unscrewing occur?

A. Where did it occur on it, do you mean?

Q. 32. Where did the unscrewing occur; as between what parts?

A. Well, the lower part, where it is made in two parts. The men neglected to set it up right.

Q. 33. How many parts has the Wilson underreamer?

(Testimony of W. O. Clay.)

A. Well, the [679] body is made in one solid part.

The lower half of the Double underreamer body was left in the hole. We did not get it out.

We are using Wilson underreamers on our lease now. Are using no Doubles at the present time.

The only other break, accident or faulty operation with either a Double or a Wilson reamer I can tell of was I lost cutters out of the Wilson underreamer up to the time they made an improvement on them. It occurred by the breakage of the tee-bolt inside of the reamer, letting the lugs or cutters go. That was about three years ago.

To "jump" a pin, that is to break the tool joints or to lose or unscrew them, generally causes a bad fishing job. Fishing jobs are frequent in oil well drilling. The less joints you have on the tools the less danger there is in running them.

Testimony of David Kinsey, Called on Behalf of Defendant.

Mr. Kinsey testified as follows:

My age is 38; a resident of Maricopa, superintendent of oil company, name, David Kinsey. Have been in the Oil Development business since 1896. Have used underreamers and am acquainted with them, the different makes. I have used Austrian underreamers, Double reamers and the Wilson reamers. Used the Austrian reamer in 1902 to 1904 or 5.

Q. 10. Please tell us the extent of your experience with the Austrian reamer.

(Testimony of David Kinsey.)

A. Well, outside of having a great deal of trouble to get a hard formation reamed, we used them right along. We had trouble to get the pipe through sometimes after using them and it would take a great deal of time usually to ream a shell or hard formation.

Q. 11. Can you tell approximately how many wells you have reamed with an Austrian reamer?

A. No, I could not.

Q. 12. Can you state roughly?

A. No, I could not say. We drilled that time about 17 or 18 wells. We used it on some and on some [680] we would not use it.

The Austrian underreamer I refer to is like that shown in Oil Well Supply Company's Catalogue under date of 1900, page 82.

I used the Double reamer in about 1908. Have used about half a dozen of them altogether. I had not used the Wilson underreamer previous to that time. Have used eight or ten. Am using Wilson reamers at present. Have no other make at present. I have five Wilson underreamers now.

Q. 27. Please tell us about your experience in using the Double underreamer.

A. Well, I have always had trouble with the Double underreamer to get it to go down to the bottom of the hole and down through the casing. I broke one set of lugs of the Double; that is about all I have ever broken on the Double underreamer.

Q. 28. What became of the lugs?

A. Lost in the hole.

(Testimony of David Kinsey.)

Q. 29. Do you remember what the extent of the breakage was?

A. Simply broke across the lug, about half way up the lug or about the slot where the lug comes.

Q. 32. Please tell us now about your experience in using the Wilson underreamer.

A. I never had any special experience with them. They always worked pretty well for me.

A. 39. I don't think there is much of a comparison but if I had the two laid out before me I would pick out the Wilson every time. As long as I could get a Wilson I would not take a Double.

The last Austrian underreamer I used was on the property of the Sunset Diamond Oil Company. I was driller on the well at the time. The other driller was Waltman, the famous Windy Waltman.

We used the Wilson reamer because it looked like a small improvement over the Austrian reamer.

Q. 65. What do you mean by a small improvement? Well it looked [681] like a better reamer than the Austrian and looked to be an improvement.

Q. 66. In what respect?

A. The size of the lugs, their cutters are a great deal larger so that it would cut a larger hole. It would go through and cut a hole large enough for the pipe to go through.

Q. 67. No other reason why you abandoned the use of the Austrian and went to the use of the Wilson reamer is there?

A. We got to buying our own reamers, the others we used to rent.

(Testimony of David Kinsey.)

Q. 68. Why did you buy the Wilson?

A. The Wilson looked good.

Q. 75. I suppose you have lost Wilson cutters?

A. I never have, no, sir.

In running the Austrian underreamers we used a stub on the bottom of it. This stub was about two and one-half feet long. I would not consider the loss of cutters of any importance. I have only used two Double reamers. I broke two cutters.

I have known of a great many breakages of Double underreamers. I think I have heard of one Wilson cutter being lost in the hole. That was on the El Comino Oil Company's property. It was caused by the bolt something like that. I have bent the safety bolt in the Wilson underreamers but I could see no difference that it makes in the operation of the reamer. I think when the bolt bent I have run them until I could get a new bolt.

Q. 109. What do you mean by being bent in your last answer?

A. Well, I have brought them out of the hole several times when they seemed to have run into a boulder and got bent. Probably in a ten inch hole they would be bent by $\frac{1}{2}$ inch to $\frac{3}{4}$ to an inch. Then we would have to bring it out of the hole and in that case we would take it out.

Q. 110. And what was the effect of the bending of that bolt so far as the body of the reamer or the cutters were concerned?

A. It made no difference as I could see, none whatever. [682]

(Testimony of David Kinsey.)

Q. 111. None at all. A. No, sir.

Q. 119. Did you have the same trouble with all the Double reamers?

A. I did, we had to tie them down to get them down into the hole.

Q. 120. Then if I understand you correctly you never got any satisfaction out of the Double reamers.

A. About the first time [683] you run it in it runs in nice and after that it don't run in to suit you.

Q. 121. To suit you. A. To suit me, no.

Q. 122. I suppose you would say you would prefer an Austrian reamer to the Double reamer?

A. Well, not exactly, no.

Q. 123. Why not?

A. I could put up with a Double reamer if it worked all right. They do better work.

Q. 124. In what respect do they do better work.

A. Well, their cutters are placed in better position.

Q. 125. In better position, in what respect?

A. Well, they do better work so that you could ream close to the bottom and closer than you could with the Austrian.

Q. 126. Do you have any trouble in pulling any of these Double reamers out? A. Once in a while.

Q. 127. To what is that due?

A. I don't know it is hard to tell. I never had any trouble in pulling the Wilson out.

Q. 138. You say that with these Austrian ream-

(Testimony of David Kinsey.)

ers you had a great deal of trouble to cut through a hard formation and to get the pipe through, will you please explain to use in detail just what you mean by that answer?

A. We always attributed it to the idea of the narrowness of the dogs or cutters. It was hard to get them to cut a larger hole through a hard formation, consequently the pipe would not follow.

Q. 139. Did you have any trouble with the Austrian reamer key-seating.

A. We did. We thought we did, we thought that was where the trouble was.

Q. 140. I suppose you mean by "key-seating" that the two dogs or cutters with the Austrian reamer cut spiral grooves into the formation instead of cutting a round hole. A. Yes, sir.

Q. 141. I don't suppose you ever broke any of the cutters of the Austrian reamer did you?

A. I don't remember of having broken any.

Q. 142. What size Austrian reamer did you use.

A. $7\frac{5}{8}$ and [684] $5\frac{5}{8}$.

Q. 143. You never used a larger Austrian reamer than $7\frac{5}{8}$?

A. Yes, I think I had a $9\frac{5}{8}$. Pretty sure I did. The first wire lines I used from 1904 to 5 or 6.

Q. 157. What depths of holes were those wells that you drilled prior to 1908.

A. 1200 feet probably 1250 feet, was about the depth, from 400 feet to 1250 feet.

Q. 158. And what was the general range of depths of the wells that you drilled with the

(Testimony of David Kinsey.)

Double and Wilson reamers?

A. From the surface to 4,800 feet.

I prefer the oil Well Tool which has the least number of joints in it.

**Testimony of John A. Bennett, Called as a Witness
on Behalf of Defendant.**

Mr. Bennett testifies as follows:

My name is John Alexander Bennett; resident of Bakersfield; occupation, driller; age, 38 years old. Have been in the oil business probably twenty-three years. My first experience was in Canada. I was born in Canada. That was near Petrolia. In the province of Ontario. I operated in Sumatra, the Island of Sumatra. Was there two years. I next went to Borneo. Was there two and half years. From there I went to Bakersfield, in Kern County. I have been in British Burma, since having first gone to Bakersfield. That was in 1903 to 1906. Since that time I have been head driller for the Sunset Security Oil Company. That is the property we are now on. I have used underreamers and am familiar with them.

Q. 19. During your experience in the oil well industry have you ever had occasion to use what are termed underreamers? A. I have.

Q. 20. When did you first use an underreamer?

A. In 1896.

Q. 21. And that was where?

A. On the Island of Sumatra.

Q. 22. And what date was that?

(Testimony of John A. Bennett.)

A. I don't recollect exactly, make it 1896 or 1897.

[685]

Q. 23. Had you ever seen an underreamer before that? A. Yes, sir. I won't say absolutely.

Q. 24. When to your best recollection do you first remember of seeing an underreamer?

A. Well, I am positive it was in Sumatra.

Mr. LYON.—Objected to as irrelevant, incompetent and immaterial. The use of a tool in Sumatra being absolutely incompetent, irrelevant and immaterial, in these proceedings.

Mr. BLAKESLEE.—We are just trying to trace the experience of this witness with oil well apparatus, including underreamers, and for that purpose we believe that the question is material and proper.

A. Well, I am pretty sure it was in Sumatra.

Q. 25. And what kind of a reamer was that?

A. Why, I think it was known as the Australian, it is not the Austrian, it is a decidedly different underreamer.

Q. 26. Can you tell us briefly the construction of this reamer?

Mr. LYON.—Same objection and particularly as it is not admissible under the pleadings and is irrelevant and immaterial being a tool used not within the United States of America or the Territories thereof and on the ground that no such defense is pleaded.

(Read the question.) A. Well, the underreamer was made with two lugs similar in shape to the

(Testimony of John A. Bennett.)

Wilson underreamer, excepting that the lugs—on the top end of either lug there was a wing came out with a hole bored through it and when it went into the body of the underreamer it lapped this way and then a pin went through this hole slit in the body and went through these two holes of the lugs to hold the same in place, then a spring went up through a hole bored in the bottom of the body of reamer and came in contact with the bottom of the wings of the lugs. The spring was held in place by a block screwed into the bottom of body of reamer.

Q. 27. What caused the movement of the cutters in this reamer?

Mr. LYON.—Same objection. [686]

A. What to expand or contract?

Q. 28. Yes?

Mr. LYON.—Same objection.

A. There was a spring.

Q. 29. What connection did the cutters have in regard to the spring in the bottom of the reamer?

Mr. LYON.—Same objection.

A. The spring inserted in the bottom of the body came up against the bottom of the cutters or lugs and the spring was held in place by a block screwed into the bottom of body of underreamer.

Q. 30. Well, let me ask it this way. Was there any part of this underreamer which acted with the cutters aside from the spring you spoke of as causing the expansion or contraction?

Mr. LYON.—Objected to as leading and upon the other ground stated in the objection to the testi-

(Testimony of John A. Bennett.)

mony in regard to this reamer which objection will be understood as reported to all subsequent questions asked this witness without specifically hereinafter repeating.

A. Why the bottom of the bit.

Q. 31. Do you remember where you got this particular underreamer?

Mr. LYON.—Same objection.

A. It was made by—I don't remember whether it was the Oil Well Supply or not. It was made by a firm known as McKenzie and Joyce, I think the firm was known as the Oil Well Supply. I am not really positive of that though.

Q. 32. For the purpose of identification only I show you a catalog of Oil Well Supply Company under date of 1900 and call your attention to the showing on page 117 thereof and ask you whether you find on this page anything which in any manner bears a relation to this first underreamer used by you about which you have testified.

Mr. LYON.—Objected to as leading and tending to educate the witness for his further testimony in this case and being incompetent [687] and not the best evidence.

(Witness points to Fig 2161 on page 17 of said catalog.)

Q. 33. Do you know what became of that first reamer? A. What became of it?

Q. 34. Yes.

A. I presume it is in Sumatra yet. As far as I know I left it there.

(Testimony of John A. Bennett.)

Q. 35. And when was it again that you left Sumatra after using it?

A. I think I left Sumatra in 1908, if my memory serves me correctly. Oh, I beg your pardon; I mean 1898.

Q. 36. Please tell us anything further that you can about your use of this underreamer in Sumatra?

A. Well, no more than has been stated between us. It served the purpose.

Q. 37. In the hole in which you used this reamer, did you use casing?

Mr. LYON.—Objected to as leading.

A. We did.

Q. 38. Please tell us what if any the use of this reamer in Sumatra had with respect to the lowering of the casing?

A. When we encountered formation that was so hard that the pipe would not go down of its own way we used this underreamer to enlarge the hole through this hard formation in order to allow the pipe to be lowered. The effect was always satisfactory.

I have used Austrian underreamers, Swan underreamers, Double underreamers, and Wilson underreamers. At present I am using Wilson underreamers.

Q. 53. Now, referring again to this particular type of reamer that you say you used in Sumatra in 1898, did you ever see any more of such type of reamer?

(Testimony of John A. Bennett.)

Mr. LYON.—Objected to as leading.

A. Yes.

Q. 54. And when and where?

A. I had one in the Midway that I brought from Canada.

Q. 55. And when was this?

A. About 1900, the year 1900. [688]

Q. 56. What did you do with it if anything?

Mr. LYON.—Objected to as being inadmissible under the pleadings; no such defense being pleaded.

A. I did not do anything with it; I brought it in case I would have occasion to use.

Q. 57. Can you tell us anything as to its subsequent history? A. This particular reamer?

Q. 58. Yes.

A. I had it at the time myself.

Q. 59. And what became of it after you brought it to the Midway Field? A. I don't know.

That reamer was known sometimes by the name of the Australian reamers. I do not believe that the Australian reamer or the Canadian would be as strong as the Wilson reamer. The Wilson cutters are stronger and have more stock in them.

Q. 72. Well, if you were to select this reamer you call the Australian reamer or the Double reamer you have referred to, which would you prefer?

A. I don't think there would be much choice as far as I am personally concerned.

I have used several Double underreamers, I don't know how many. I have used Double reamers in probably twenty-five holes.

(Testimony of John A. Bennett.)

Q. 84. Now, as to these Australian underreamers. Did you ever see one of them made?

Mr. LYON.—We object to that as leading and as irrelevant and immaterial.

A. I have.

Q. 85. And where was this? A. In Canada.

Q. 86. And when?

Mr. LYON.—Same objection.

A. About 1900, the last one I saw made.

Q. 87. What part of Canada?

Mr. LYON.—Same objection.

A. Petrolia, Ontario. [689]

Q. 88. Did you ever see more than one of them made?

Mr. LYON.—Same objection, leading and the other grounds stated.

A. I have.

Q. 89. Approximately how many?

Mr. LYON.—Same objection.

A. I have seen several in the course of construction. I have never watched them to know that they were completed but have been in the shops or shop at different times and seen several in the course of construction.

Q. 90. And what was the name of the shop if you can remember?

Mr. LYON.—Same objection.

A. The shop was known by the firm of McKenzie & Joyce.

Q. 91. Can you state of your personal knowledge what was done with any of these reamers that you

(Testimony of John A. Bennett.)

say you saw in progress of manufacture at this shop?

Mr. LYON.—Same objection.

A. They were shipped to foreign countries, Australia, Sumatra, Borneo, different countries.

Q. 92. Did you ever see any of them used aside from those that you have heretofore testified about as using in Sumatra and bringing to California?

Mr. LYON.—Same objection and as leading.

A. No, I have not, you mean any different places?

Q. 93. At any place?

Mr. LYON.—Same objection.

A. I have seen other drillers use them in places I have been and places I have been working.

Q. 94. In how many of the places.

Mr. LYON.—Same objection.

A. Borneo, Sumatra and Java.

Q. 96. I think you have referred to a Swan underreamer? A. Yes.

Q. 97. Did you ever see one of these used? [690]

Mr. LYON.—Same objection.

A. I have.

Q. 98. Did you ever use one yourself?

Mr. LYON.—Same objection.

A. Not personally except in capacity of superintendent.

Q. 99. Where did you first see a Swan used?

A. In Burma.

Q. 100. Can you tell us anything about the work done by this Swan underreamer?

Mr. LYON.—Same objection.

(Testimony of John A. Bennett.)

A. We found the Swan underreamer more efficient than the Austrian underreamer, except that it was attended with a great deal of difficulty in extricating it from the hole after the underreaming had been done.

Q. 103. What can you tell us of your experience with a Double underreamer?

A. The Double underreamer was not satisfactory in trying to enter a hard formation that we have encountered in the well of the Sunset Security Oil Company. We were not able to accomplish the work, owing to the lugs or cutters constantly breaking.

Q. 104. Can you state in what part of the lugs or cutters these breakages occurred?

A. They usually broke at what is known to us as the eye. Also breaking down at what we term the heel.

Q. 105. What service does this eye perform that you refer to?

A. The eye is the place where the key is inserted in order to suspend the cutters on the rod of reamer.

Q. 106. To what cause do you attribute this breakage of the Double cutters at this point?

A. To the lack of strength in the cutters, materially weak in their construction.

Q. 107. Can you produce any such cutters or parts thereof?

A. I can. (Witness produces seven pieces of metal.)

Q. 108. Referring now to the five short pieces of

(Testimony of John A. Bennett.)

metal, please [691] tell us about them with respect to the breakages you have referred to?

A. The five pieces of metal referred to are the upper ends of the Double cutters that broke in the process and effort of trying to underream through a hard shell in the Sunset Security Oil Company's well.

Q. 109. Can you state approximately when these breakages occurred?

A. Well, lets see, it was within the last year, the last twelve months.

Q. 110. Do you know what became of the remaining portion of these broken cutters?

A. Most of them were lost in the hole.

Q. 111. During that period of time have you or have you not had further breakages of this nature?

A. I have.

Q. 112. Can you state roughly how many?

A. No. I could not say exactly how many I have had, I have had quite a number. I have not kept any definite track of them.

Q. 113. Have you used Wilson reamers during that time?

A. The latter part of the twelve months I have.

Q. 114. Have you had any breakages in Wilson cutters during that period?

A. No breakages, excepting, of course, that a crack is not a break.

Q. 115. Well, I will ask you if you have had any cracks in Wilson cutters during that period?

A. I have had.

(Testimony of John A. Bennett.)

Q. 116. How many for instance? A. One.

Q. 117. And in what portion of the cutter?

A. In the bottom end.

Q. 118. And am I correct in designating that as being in the cutting edge portion of the cutter?

A. Yes, sir.

Q. 119. Have you ever had any cracks during that period of time in the cutting edge portion of the Double cutters? A. I have.

Q. 120. Roughly how many cases?

A. Many cases that I remember of.

(The five pieces of metal just discussed by the witness are offered in evidence in group as "Defendant's Exhibit, Upper Ends of Broken Reamer Cutters, Produced by Witness Bennett.") [692]

Q. 121. Please now refer to the other two larger pieces of metal and tell us about them with respect to breakage?

A. Well, the first one is broken in the same manner as the five pieces just referred to expecting that it didn't break entirely off. Just required a slight tap with a hammer after it was withdrawn from the hole to break it off.

Q. 122. When did this breakage occur?

A. During the time I was using the Double under-reamer.

Q. 123. At what place?

A. Place referred to, Sunset Security's Well.

Q. 124. What part of the cutter is this?

A. That's the lower end of the cutter.

(Defendant offers in evidence the larger pieces of

(Testimony of John A. Bennett.)

metal just discussed as "Defendant's Exhibit, Broken Off Lower End of Double Reamer Cutter, Produced by Witness Bennett.")

Q. 125. Please tell us about the remaining part.

A. The remaining piece is simply cracked. We noticed it in time to prevent any further risk being taken.

Q. 126. When and where did this crack take place?

A. The same place as the other exhibits. The time was during the use of the Double underreamer.

(This last piece of metal is offered in evidence as "Defendant's Exhibit, Cracked Double Reamer Cutter, Produced by Witness Bennett.")

Q. 127. Please tell us further if you have anything to say about your experience in using the Double cutters.

A. Well, our experience in using the Double cutters has not been satisfactory, so much so, that I discontinued their use as being dangerous to the construction of the well.

Q. 128. Can you tell us any other reasons that led you to such discontinuance of the use of the Double reamer?

A. I had no reason whatever excepting in the interest of the well that I was and am drilling. [693]

Q. 129. Well, what I mean more particularly was reason pertaining to the material itself?

A. Well, in the Double there is joints in the middle which I consider a hazard. While I have never lost the lower portion of the reamer, I have often found it to be loose and could easily have been lost if we

(Testimony of John A. Bennett.)

had have run it a greater length of time in the hole. Also in the Double reamer cutter there is so much material cut away in order to cause the lugs to expand, or cutters I had better call it, that it is materially weak. Such I found not to be the case with the Wilson cutters and naturally wanting strength in the lugs in order to obviate these breakages I chose the Wilson underreamer as being more materially perfect. That is all.

Q. 130. Have you anything to state with respect to the Wilson or Double reamers concerning the ease or readiness with which the casing follows the reaming operation?

Mr. LYON.—Objected to as leading.

A. I don't think that the casing will follow one reamer any better than the other, not if the reaming has been done properly and the hole is large enough. My trouble with reamers has been in getting one that is materially strong enough to do the work. After the work is done the pipe will always go. The trouble is and has been in getting a reamer to do the work. That's all, I guess.

Q. 131. When you do your next reaming operation what reamer do you propose to use?

A. The Wilson.

Q. 132. As to any tools specified as oil well tools intended to do the same class of work, one of which had more joints than the other, would you make a preference?

A. Every joint is a hazard, the less joints the less hazard.

(Testimony of John A. Bennett.)

I went to Sumatra in about 1896.

The well we are now working on in the Sunset Security is about 4,000 feet deep. We are entering 6 $\frac{1}{4}$ " casing. I have broken one of the dovetails of the Wilson reamer and have also broken the Tee Rod.
[694]

Q. 185. What happened when you broke that rod?

A. The cutters dropped down on the bottom of the body.

Q. 186. Never lost a Wilson cutter in the hole, have you? A. Never.

Q. 187. Have you ever known of Wilson cutters being lost in the well hole?

A. Not positively.

Q. 188. You have heard of such things, have you not?

A. I have heard of them, yes, but not with the improved underreamer.

Q. 195. Can you tell me how many times the cutters of "Defendant's Exhibit, Upper Ends of Broken Double Reamer Cutters Produced by Witness Bennett," have been redressed respectively?

A. Some of them have not been run into the hole but once, having broken in the first attempt to use them. Others have been dressed and used several times.

Q. 196. Can you tell us how many times?

A. Several.

Q. 197. What do you mean by several, a dozen times?

A. More than one or two times, I don't mean twelve

(Testimony of John A. Bennett.)

times. I would say readily three or four times.

Q. 198. Not to exceed four times?

A. I would not go on record as saying any one of them has been dressed more than four times, I know that some of them has been more than others.

Q. 199. Did you ever have any other breakage in any manner whatever of the Wilson underreamer other than the breakage of the dovetails and the breakage of the spring actuated rod, if so state specifically what such breakage was?

A. No, I don't think I have, not that I can remember just now.

Q. 200. Did you ever use the Wilson reamer without the bottom bolt in the lower end of the reamer?

A. No, I have not.

Q. 201. You have found, have you not, that this Sunset Security Well that you are now drilling upon here has been an exceedingly difficult one to drill, have you not? A. In some respects. [695]

Q. 202. In what respects?

A. Cavey ground, cavey formation, particularly.

Q. 203. In any other respects?

A. No, excepting, of course, in the underreaming.

Q. 204. What in the underreaming?

A. In getting an underreamer that was sufficiently strong enough to do the work.

Q. 205. Comparing other underreaming jobs that you have done with the underreaming in this Sunset Security Well, it has been much more difficult, has it not?

A. More difficult than some that I have done but

(Testimony of John A. Bennett.)

I have had other wells that were pretty difficult to underream.

Q. 230. Mr. Bennett, will you now describe in full the construction and mode of operation of the underreamer relative to the parts of this underreamer you say you used in Sumatra?

A. On the Australian underreamer the cutters go into the body with the wing on the top of each cutter through which a hole is drilled and a bolt inserted through a slot on the side of the body. The spring is inserted in the bottom of the body and comes up under and against the wings of the cutters and is held in place by a block screwed into the bottom of the body. Is that sufficient?

Q. 231. It is sufficient if that is the best description you can give, I am asking you to describe as fully as you can and to be absolutely fair to you I will state that I want such description just as full as you can give it in order to test your testimony.

A. The expansion of the lugs in the Australian underreamer is accomplished in much the same manner as it is with the Double. Well, I don't think that I care to attempt to describe it any further.

Q. 232. What size reamer was this that you used in Sumatra?

A. I am not sure I think it was an 8 inch.

Q. 233. And what was the name of the company you were working for down in Sumatra at that time.

A. Why, it was not a company, it [696] was headed by a man by the name of Boisservain of Amsterdam, Holland.

(Testimony of John A. Bennett.)

Q. 234. How long were the cutters or bits on this reamer? A. On the Australian reamer?

Q. 235. The one that you used in Sumatra?

A. Oh, I should judge them to be ten inches, maybe twelve inches in length. Cannot say positively about that.

Q. 236. Was there any inter-engaging dovetails on the body and on the bits like in the Double reamer?

A. No, they just went into the slot on the side and a key went through. There was nothing in the way of dovetails, if my memory serves me. From 1903 to 1906, while I was in the Burma Fields, there were no Double reamers used there that I know of?

Q. 288. About how long were you employed upon this well in Sumatra?

A. I don't remember exactly how long I was on the wells. I drilled eleven wells during the time I stayed there. I think it was eleven.

Q. 289. As near as you can remember how long were you there?

A. The first well, it took me about a month, I think I was a little longer on that first well.

(Interrupting.) Q. 290. How long did it take you on the 11 wells?

A. I think it was about 19 months. I beg your pardon, I mean I was 19 months actually employed in the drilling and the constructing of the 11 wells.

Q. 291. And what were the depths of these wells?

A. Varying depths, 200 feet to 1,100 feet.

Q. 292. From 200 feet to 1,100 feet? A. Yes.

Q. 293. And what size casing did you use?

(Testimony of John A. Bennett.)

A. I think it was 9, 8, 7 and 6 inserted pipe.

Q. 294. How far down did you carry the nine-inch casing?

A. I can't remember exactly the different wells, we carried the pipe to different depths.

Q. 295. Was there much underreaming required there in these [697] Sumatra wells?

A. Some of them, yes, required considerable.

In dressing underreamer cutters we do not affect the cutter. We do nothing with the shank of the cutters when we dress them up to size.

The underreamers which we brought from Petrolia to Bakersfield in 1900 were taken direct from Bakersfield on their arrival immediately to the Midway field. They were taken from the cars in Bakersfield to the Midway Field. While we had that reamer at that well there was scarcely a day that visitors did not stop. This reamer was alongside the road. Possibly 50 feet from the road. I have known of people stopping and looking at that reamer. There was another well being drilled about a half mile from our well. The men who were working on that well besides myself were John S. Stokes, J. L. Bruce, E. C. Brookes, and myself, that is all. That well was located on Section 25-32-23. I purchased that reamer myself in Canada of McKenzie & Joyce.

Testimony of James L. Bruce, for Defendant.

Testimony of JAMES L. BRUCE, who testifies as follows:

My age is 36; manager of Southern Garage; resi-

(Testimony of James L. Bruce.)

dence, Bakersfield, California. I was previously superintendent of the Associated Oil Company at Oil Center. I have been in the oil business since I was 16 years old. I have been in every department of it and am familiar with underreamers. Up to twelve years ago I was in the Canadian Fields at Petrolia, Ontario, Canada, in which fields I was born. The first adjustable underreamer I used was in the Midway Field. I was working out on the section 25 Hill. By an adjustable underreamer I mean one with an expansion, an underreamer where they expand after going out of the casing or expand in the casing or expand underreaming below the casing. We called that reamer an Australian underreamer. As I remember it came from Petrolia, Ontario with other [698] tools which were brought from that place. Those tools were brought to California by Bennett and Stokes. They drilled that well about 700 feet and encountered a large body of water sand and abandoned it for a water well. The property was known as the Sunset Coast Oil Company. The tools were removed to that property some time between 1901 and 1902. It was in 1901 or 2. I remember of running that reamer into the hole and then remember we did not have very good success with it. We were using casing.

Q. 37. Please state to the extent of your recollection what the construction and arrangement of the parts of that Australian underreamer was?

A. Why, as near as I can remember it was an expansion reamer, two lugs expanding over the bot-

(Testimony of James L. Bruce.)

tom shank of the reamer which was tapered in order to get it down in the hole. The two lugs were tied together with a rope and after the tools were set on the bottom the rope was broke and the lugs expanded in order to ream the hole large enough to get the casing down and give it clearance.

Q. 38. Do you remember anything further with regard to the arrangement of the lugs?

A. Why, I remember the lugs slipped in past each other and a pin went through them in some manner I don't just recollect, below the lugs.

Q. 39. Below what part of the lugs?

A. Well, I can't say, I don't just remember just how it was constructed.

Q. 40. Do you remember anything about the shape of these lugs?

A. Why, I haven't a very vivid recollection of just exactly how they were but the offset on them was something similar to the Wilson or Double under-reamer but they were not exactly the same shape.

Q. 41. Do you remember how these lugs extended with respect, we will say, to the up and down direction in the hole?

A. How they extended? I don't understand how you mean.

Q. 42. Well, how they hung, in what direction they extended?

A. Well, when the rope was broke, of course, they just slipped out [699] a certain distance farther than they were when they were tied together with the rope, according to the size of the casing used

(Testimony of James L. Bruce.)

in the hole and the lower ends were larger than the size of the shoe.

Q. 43. Where were the other ends of the lugs with respect to the working or cutting ends?

A. Why, they were fastened together with a pin, overlapping each other, with the shank of the reamer and the slot in the side of the reamer, which worked up and down as you pulled the lugs up and down.

Q. 44. As to these ends that were connected with a pin, in what direction were they that did the cutting? A. I don't just get what you mean.

Q. 45. In what direction did the lugs lie between their ends? A. At the top.

Q. 46. Was there a top end do I understand?

A. There was a top end of the lugs where the bolt went through them.

Q. 47. Well, what would you call the cutting end?

A. Well, the cutting ends *would the* bottom ends.

Q. 48. Well, calling one end the top end *what you* call the cutting end?

A. Well, the other end the cutting end.

Q. 49. Well, in reference to top or bottom or side what would you call the cutting end?

A. Call them lugs.

Q. 50. Well, you said there was a top and there was a bottom end so which end would you call the cutting end?

A. The end that did the cutting. There is a spreading bearing, as I would call it, at the top of these lugs that allows them to spread and do the cutting.

(Testimony of James L. Bruce.)

Q. 51. And these spreading bearings that you speak of as being used were located in what respect to the lugs?

A. Well, there was an offset in the lugs which corresponded with the top and bottom of the shanks.

Q. 52. And in what part of the lugs was that offset? A. Probably [700] about the center.

Q. 53. And where did the spreading bearing lie with respect to this in order to offset the sides?

A. Well, at the offset on the side, in order to pull the lug in and get them down through the casing we had to pull over the taper of the shank.

Q. 54. Well, where was that taper in the shank located? A. On the bottom of the reamer.

Q. 55. And how were the lugs located with respect to the bottom of the reamer?

A. Well, when your lugs were out going through your casing ready to cut you would be on the full part of your reamer and when it was pulling down going through your casing the lugs would pull down going through the casing.

Q. 56. Can you tell us anything further as to the use of this Australian underreamer?

A. No, I just remember that we run it and did not consider it satisfactory. That's about all I remember.

Q. 57. Do you remember who put it in the hole?

A. Well, I don't remember but I believe Stokes put it in the hole himself.

Q. 58. Were you present at the time?

A. I was present when it was put in.

(Testimony of James L. Bruce.)

Q. 59. Did it come out of the hole? A. Oh, yes.

Q. 60. Were you present then?

A. I expect I was when we put it in, I can't remember though.

Q. 65. You said it was not satisfactory, can you tell us the reasons?

A. Well, as I remember it did not operate or ream the hole satisfactory. That is as near as I can remember, it was not heavy enough. It was not the kind of formation that you would use to underream in.

Q. 77. In a general way please compare the Australian underreamer you used with the Wilson or Double, either one, from a standpoint of efficiency or lack of efficiency the Australian reamer to which you have referred to?

A. Why, although there is a great deal of difference in the general make up of the two reamers, in some ways they had principles that were similarly relative. [701]

Q. 81. In a general way how would specify that the Australian underreamer was more similar in principal to the Wilson and Double than to the Austrian underreamer?

A. Well, on account of the expansion of the lugs.

Figure #2161 of the Oil Well Supply Company's Catalogue of Pittsburg, Pennsylvania, bearing date of 1900, is at least similar to the Australian Underreamer I have referred to as the one which was brought from Petrolia. I can't say that it is exactly

(Testimony of James L. Bruce.)

like it but it was similar in construction, as near as I can remember.

I think the cutters were about fifteen inches long. From that cut I would be able to make an underreamer exactly as it is supposed to be illustrated therein. I would connect the upper end of the cutters with the pin and the pin would go through the body of the reamer and through the cutters interlapping. The pin is shown in the cut. I should judge the total over all measurement would be two and one half or three feet. If I had no knowledge of such Australian underreamer other than is shown in this cut 2161, I could not figure out the construction. I could not say of it being used but the once.

A. 114. Well, I used a great many of the Wilson underreamers out there and they always done what was required of them in that field.

Q. 115. Did you have many breakages to many of the Wilson reamers there?

A. No, not that I remember of outside of the wearing of the reamers occasionally and we would break off a lug in the reaming of a well.

I have never seen one of these Australian reamers in California except this one in 1900. The Oil Well Supply Company has been in business in Bakersfield ever since I have been in the country. They were here in 1900. I cannot recollect a time when they were not here. Based upon my experience with this Australian reamer in 1900, I would not consider such a reamer as that a safe reamer to [702] attempt

(Testimony of James L. Bruce.)

underreaming any territory such as Lost Hills, for example.

I don't think it is necessary to have a water course in an underreamer for the reason that your lugs in the hole are so much larger than the body of your reamer that it will never obstruct the fluid passage. If the reamer was so large as to not permit a clearance it would not be an underreamer at all. By that I mean the body of the reamer.

**Testimony of Hibbard S. Williams, Called on
Behalf of Defendant.**

Mr. Williams testifies as follows:

My age is 42; occupation, oil operator and proprietor of Machine-Shop Works at McKittrick. Have been in the oil industry since 1901.

A. For seven years I was superintendent of the Associated Oil Company in the McKittrick district, and also in the Kern River field; since then I have been operating for myself.

Am familiar with underreamers and have used them in various fields in the State of California. The first reamer I had experience with was an Austrian underreamer. That was in 1901.

A. 13. That was, well, it is my recollection—I don't know who owned the tool, but we had occasion to acquire one of the Green-Whittier property in 1901, and this Austrian underreamer was talked about—suggested to run it, and finally we backed out of it; it didn't look as though it would be feasible, and we made up our minds we didn't want it.

(Testimony of Hibbard S. Williams.)

Next underreamer used was the Double reamer in 1904 in McKittrick field, and then used the Wilson reamer in the same year and the same place.

Q. 20. Are you using any underreamer at the present date?

A. At the present date? No, I have a full string of Double's and a full string of Wilson's that I have for renting purposes. [703].

Q. 21. What was the last underreamer that you yourself used?

A. 21. That I myself used personally?

Q. 22. Yes. A. Was the Double.

Q. 23. Which of these underreamers, if either, do you use most? A. Have used the Wilson.

(Here the witness was duly sworn and cautioned according to law, he swearing that the testimony already given was, and that the testimony to follow shall be the truth, the whole truth, and nothing but the truth.)

Mr. BLAKESLEE.—Q. 24. How much more have you used the Wilson than the Double, and, if you will, first state with respect to the element of time, and then, approximately with respect to the number of holes?

A. Well, I will say that I have used the Wilson underreamer from 1904 to the present time, and comparing that with the Double underreamer, I will state that I have practically used the Wilson exclusively. The only reason for my using the Double was for the fact that I didn't have a Wilson to run, or I

(Testimony of Hibbard S. Williams.)

would have used a Wilson, I didn't have the right size.

Q. 25. Can you state why you have used the Wilson reamer almost exclusively?

A. I considered it the safest and the best.

Q. 26. Can you give a little further, please, the reasons for your conclusions on your part?

A. I considered the cutters much stronger—less liable to break; and the elimination of the center-joint is a big feature in the Wilson. I considered it the stronger reamer, and one that causes less trouble; it gives much better satisfaction.

Q. 27. Why do you consider that the elimination of the center-joint is an advantage for the Wilson reamer?

A. For the reason that there is no possibility of the reamer [704] coming in two while at work in the hole—that is the principal reason.

Q. 28. In using oil-well tools of different kinds, what can you say as to accidents of this kind occurring at joints?

A. I can't give you any positive date regarding the fact of the Double underreamer becoming unscrewed at this joint, but I will say—even under oath—that I know of two occasions (if I had the opportunity I could get sufficient data) where the Double underreamer has come unscrewed in this center-joint.

Q. 29. Do you know, of your own knowledge, also, what followed such occurrences at the center-joint?

A. It was practically a hopeless fishing job. There was one particular case—I don't know whether the

(Testimony of Hibbard S. Williams.)

well was abandoned absolutely for that reason, but it offered a good excuse, and was abandoned.

Q. 20. Can you tell me where these occurrences took place, that is, on what properties?

A. Well, there was one well that was on the "Associated," and the other well was a wild-cat hole—it was drilled out from McKittrick there, I don't know the name of it, but I can give you that data by referring to my records.

Q. 31. (Mr. LYON.) Do you know these matters of your own personal knowledge?

A. I tell you, being proprietor of the Iron Works, I have fishing-tools for rental, and these things come up.

Q. 32. They are told you? A. Yes.

Q. 46. In using your Double underreamer, have you ever had any breakages occur of any kind, in running the Double? A. No, sir.

Q. 47. Have you ever had such breakages in the running of the Wilson?

A. Breaking of the joint do you mean? [705]

Q. 48. At any part.

A. Breaking of any part of the tool. Yes, I have, I have broken the underreamer cutters of the Wilson underreamer.

Q. 49. And about the Double cutters?

A. I never broke any.

Q. 50. In approximately how many holes have you used the Double? A. In two holes.

Q. 51. In how many, roughly, have you used the

(Testimony of Hibbard S. Williams.)

Wilson? A. Roughly I should say about ten.

Q. 52. How many cutter breakages did you have in using the Wilson?—

A. I have broken two cutters.

Q. 53. Can you state what occasioned such breakages, so far as you know?

A. I do, it was occasioned by the fact that we were running the underreamer in extra heavy pipe that required the cutters to be turned down to such small size that the cutters were weakened, to such an extent, we were drilling in such hard formation, it would be absolutely impossible to expect them to stand.

The purpose of the safety bolt in the Wilson reamer is to prevent the mandrel-bar from dropping out, in case a Key should break, or the mandrel should break; prevents the cutters from dropping in the hole and losing them. The first Wilson underreamer I used was in 1904. It was sent to me from the Bakersfield Iron Works. I returned it to the Bakersfield Iron Works when I had finished with it. Used it about 30 days. I had no trouble with it whatever. It was the first Wilson reamer I ever saw. It was used on the well called "Giants number 51." We started drilling in on August 24, and finished in December of 1904. I have never seen a Double reamer which had in any manner been worked upon so as to permit use of it after it had been worn past use.

Q. 95. When you next have occasion to use an

(Testimony of Hibbard S. Williams.)

underreamer, what underreamer will you use?

A. When I next have occasion to use one I will always use the Wilson. [706]

Q. 96. Have you anything further to state as to why you will always use the Wilson?

A. I consider it the safest; it has the strongest cutters; it has eliminated this center-joint; it has a safety-bolt to eliminate losing cutters in the hole.

Q. 104. You have referred to the "bottom bolt" in a Wilson reamer, and to its function of catching the cutters in case of a breakage, so as not to lose the spring-actuated rod. This bolt also forms a connection between the two parts of the lower end of the Wilson reamer, and braces such parts against any tendency to be spread outward, does it not?

A. Yes, sir.

Q. 105. Have you ever used the Wilson reamer without this bottom bolt in it?

A. I have run them where they have been neglected to be put in, on a soft formation, or where we didn't anticipate any trouble,

Q. 106. You would not consider it safe to use them on a hard formation without that bolt?

A. I would prefer to have them in—I would not lose my cutters.

The re-machining of Wilson underreamers makes them practically new reamers.

(Witness is shown Oil Well Supply Catalog, 1900, page 117, Fig. 2161.)

I have never seen this cut before. I never have

(Testimony of Hibbard S. Williams.)

seen an underreamer like this. From this cut I do not know as I would be able to make an underreamer embodying that construction. I think I would have to do an awful lot of guessing there. From that cut I cannot see how I would make the reamer. Based upon my experience, I do not believe such an underreamer would be safe and reliable tool in California drilling.

Mr. BLAKESLEE.—Q. 126. Referring again to this cut, 2161, in Oil Well Supply Company 1900 catalogue, please look at it and point out such features as strike you as being analogous to anything you know about underreamers, if you find such. [707]

A. Well, I consider this, whatever constitutes this bottom joint, to be a weak feature; also the fact of it shouldering up against this body here (indicating) as being another weak feature, for this reason, that any underreamer, unless your cutters are sharp, they have a tendency to wedge and drive in; and it appears to me that if these cutters would become dull at the point, it would have a tendency to wedge or key-seat in the hole; they would not cut—just simply key-seat.

I would say that the Canadian underreamer is more like the Wilson than the Double as it has no middle joint in the body. If the cutters of the Canadian reamer move their action would compare with that of the Double.

Mr. BLAKESLEE. — Q. 175. Proceeding similarly with the Double underreamer, and entering the

(Testimony of Hibbard S. Williams.)

two slots, what would you encounter?

A. You would encounter the body of the reamer.

(At this point the objection already set forth to Q. 174 was made, whereupon Mr. Blakeslee stated, "I will withdraw and restate.")

Q. 175. Are there any slots in the Double underreamer which accommodate the cutters?

A. There are.

Q. 176. Are there any slots confined in any way at their inner portion?

A. They are dovetailed.

Q. 177. I mean the portions of it lying farthest in the body.

A. No, there is nothing there in the Double; the slots are milled into this body, and there is a center of it is unlike the Wilson—the Wilson is hollow and the Double is not.

**Testimony of Sam G. Lamb, Witness Called on
Behalf of Defendant.**

Mr. Lamb testifies as follows:

My name is Sam G. Lamb; age, 41; residence, Bakersfield; occupation, oil-well driller. Have been operating for twenty-five years. My experience first commenced in Pennsylvania. Have [708] operated in Ohio and California. Am familiar with underreamers. First reamer I ever saw was in Los Angeles. It was a Kellerman underreamer. That was in 1899 on Ocean View Avenue. We underreamed the hard places with the Kellerman reamer. The reamer was owned by Mel Kellerman. I had

(Testimony of Sam G. Lamb.)

different sized Kellerman reamers on a different sized casing. I saw other Kellerman reamers besides that. The reamer was like that shown in Kellerman U. S. Patent 679,384. We drilled probably twelve hundred feet. We finished the well, yes, lowering the casing.

We had trouble with the Kellerman reamer in getting it out of the hole.

I have used Austrian underreamers, Swan underreamers, Double reamers and Wilson reamers. I at one time used Austrian reamers nearly constantly for over a year. Drilled possibly four or five wells, while using Austrian underreamers, reaming shales and hard shells. Got pretty fair results, they were frail. They was not exactly right. In some cases where it was very hard we had very little difficulty, other times where it was hard we broke the lugs sometimes and had considerable trouble. But at that time we considered them about the best we could get. We were able to lower our casing, using Austrian reamers but sometimes it took extra time to do so. Along about this time I run the Swan, a little after I had run that Austrian underreamer. I found that pretty much the same as the Austrian.

We used the Swan underreamers on the Prosperity Oil Company's property in Kern County, on Poso Creek.

Have used the Double reamer and in most cases we have had good results with it. However, I had one case where I could not get results with the Double reamer. That was in Coalinga. It was in 41½"

(Testimony of Sam G. Lamb.)

casing. It would not reamer the hole large enough to permit the casing to go through. We did not abandon the hole but we got a Wilson reamer which reamed the hole and we finished [709] the well with it. We did not have a bit of trouble with the Wilson reamer. It did the work satisfactorily. I have used lots of tools in the last few years, I suppose I have used five or six Wilson underreamers or had them used. Have never had any trouble with them. I prefer the Wilson reamer especially where I am using heavy pipe and heavy collars as the Wilson will expand more and the casing will follow better. Again there is one joint less in the Wilson reamer body and I believe that avoids danger—makes the reamer that much safer.

Q. 102. There was practically no other reamer in use out there at the time the Wilson came out, except the Double, was there? A. I don't think so.

Q. 103. Based upon your experience then up to the time the Wilson reamer could be had, the Double reamer was the only reamer used in California?

A. Yes, it was the only practical reamer we had up to that time.

Mr. LYON.—That is all.

Redirect Examination.

Mr. BLAKESLEE.—Q. 104. You have testified about using other reamers in going through shells with them prior to using the Double reamer; in view of your testimony will you please tell us what kind—when you state that the Double reamer was the only

(Testimony of Sam G. Lamb.)

practical reamer—that you had prior to the advent of the Wilson reamer??

A. We used the Austrian, that was the best reamer. Well, we got along with it and got the wells down, though, really, it was not right; there was not hardly a practical reamer. We got along with that because we had no better. It sometimes took two or three weeks to do what should be done in twelve hours.

Q. 105. In what sense do you mean that the Double reamer is a better reamer?

Mr. LYON.—Objected to as leading.

A. Yes, I considered the Double reamer a better reamer than the [710] Austrian.

Mr. BLAKESLEE.—Q. 106. Then in using the word “practical” please state how you meant to use it.

A. Well, these reamers was of a different age; what was considered practical at one time would not be considered practical now. When the Austrian was the best reamer we had considered it was a pretty good tool; but when a better reamer came out the Austrian was discarded and was not considered of any use. The Double reamer was not nearly so good when it first came out as it was later—they have all improved their reamers. We used to take six months to drill a well that we will drill in one now.

Q. 107. What did you wish to say with regard to these practical reamers with respect to the coming of the Wilson reamer in the field?

(Testimony of Sam G. Lamb.)

A. When they got to using heavier pipe and drilling deeper wells and harder territory they could not have done that with the old reamers we had at one time.

Q. 108. What did the Wilson reamer have to do with this?

A. It has got more expansion than any other reamer I have ever saw. It will go down casing that is quite heavy, small inside diameter, and will cut a hole large enough to let it through.

Q. 109. How would you apply your meaning of the word "practical" relative to reamers of the present day to the Wilson reamer?

A. I consider it is practical. At the time we ran the Austrian and the Swan underreamers we run light casing. It would cut a hole big enough to let light collars through; but when we used a heavy casing and heavy collars in most cases you could not get a Double down so that it would let that heavy collar through.

Q. 110. What did you think then that the adoption of the heavier casing did in the improvement of the reamer?

A. Well, the improvement of the reamer became necessary when you used the heavier casing. [711] They improved their calf wheels at that time, also improved the rig irons now using sprocket wheels and chain instead of rope for the transmission of power. We used Manila lines where we use wire lines. There is no Manila lines used at all now for

(Testimony of Sam G. Lamb.)

casing and it never was the right thing.

When I used the 4½" Double reamer in Coalinga that I had the trouble with I certainly did know that the Union Tool Company made two kinds of cutters, one for heavy casing and one for light casing. I used the cutters they recommended for the heavy casing, and I dressed the cutters out as wide as I could. I consider that the Double reamer is impracticable in the small sizes where heavy casing is used. The Double reamer I was using was a new reamer and it would not do the work. I got a Wilson reamer and it did the work perfectly. That is my experience. In ordering that reamer I gave the inside diameter of the casing as well as the outside diameter of the shoe and collars. [712]

**Testimony of William Edwards, Witness Called on
Behalf of Defendant.**

Mr. Edwards deposes and states as follows:

My name is William Edwards; born in 1853; resident, Burlingame; occupation, blacksmith. Am with the American Forge Company at the present time. For about four and one half years prior to my engagement with this Company I was living retired—out of business. Before that I was in business for myself, then known as the William Edwards and Company. Previous to that my firm name was Russell and Edwards. Previously that my firm name was James W. Russell and Company. We manufacture artesian well tools and machine forgings. We manufactured all kinds of oil well

(Testimony of William Edwards.)

machinery and apparatus, drilling tools and etc. We shipped goods to the Pacific Coast, Hawaiian Islands, Mexico, Japan and Australia. I made underreamers for underreaming casing. We made one special reamer here, that was the J. E. Day reamer. We made a regulation reamer for water wells. Well, I am positive of making one, and I believe that I made two, but I would not swear to two; but I remember positively, I will swear, to making one. I did the actual forging on that reamer myself. The machine work was done by C. H. Evans & Company, a firm which is still in existence. They are on Fremont Street near Howard Street in San Francisco, Cal. I did that work in 1892, if I recollect correctly. I will make a sketch of the Day reamer as it was made at that time which will explain it. It was made so that it would go down inside of the casing and when it got below the casing it would expand and cut a larger hole than the casing. Well, the reamer consisted of two cutting parts; A was the cutting part of the reamer; B is a dart for expanding the reamer jaws; C was a spring that was used to force the dart in between the cutters; D is the thread connection connecting the reamer with the drill stem; the jaws or cutters of the Day reamer were moved relatively upwardly by the [713] spring and expanded over the dart. The jaws were collapsed by striking against the casing which compressed the spring and the cutters would collapse over the end of the dart. The cutters would strike against the shoe remaining station-

(Testimony of William Edwards.)

ary, and the dart would move up and from between the cutters. The dart would fall into a recess in the cutters which allowed the cutters to close together. The machine work was done under my direction. I supplied the drawings and the patterns for them to work by. I saw the work frequently while it was in the course of manufacture. The reamer was made on the order of a mining company of which Mr. Prather of Oakland was one of the firm. It was used by a driller named Fox. Fox gave us the instructions. He was to use it. The tool was shipped with other tools we made to a mine and Mr. Fox there operated the tools.

Q. 94. Tell us what you know about the operations, of your own knowledge.

A. Well, I don't know anything of the operation any more than it was operated by Fox, because it was made for Fox—Fox was the driller working for this company, and Fox superintended the making, of the tool in our shop. He was to operate the tool. I never saw Fox operate this tool.

I shipped the tools myself. That reamer I think was above five feet long, the whole tool. The reamer is made so that it will cut a large enough hole to get a clearance for the cutting-shoe on the point of the casing. Its expansion was probably $1\frac{3}{4}$ ". I am positive that the expansion for all reamers is made so that it will cut a large enough hole for the cutting shoe. At least for whatever sized casing it is to be used for.

By Mr. BLAKESLEE.—The sketch produced by

(Testimony of William Edwards.)

witness and referred to in the course of this deposition is offered in evidence as "Defendant's Exhibit Edwards Sketch of Day Reamer." [714]

The reamer to which I referred as being used for water wells was a different reamer from the Day reamer. It was an entirely different tool. The cutters we made for the Day reamer were about four feet long. The cutters of the Day reamer were held in place by a cut-away shoulder that shouldered on the upper portion of the dart. J. W. Russell continued in business for some three years, then it was J. W. Russell & Company; then it was Russell & Edwards; afterwards it was William Edwards; then I succeeded to the business after that. We continued to carry on the business of manufacturing artesian and oil-well boring and drilling tools until 1908. The business is still in existence, running under the name of Edwards and Forest, successors to William Edwards & Company; during all of that time we continued the same line of business. The regulation reamer for water wells that I speak of is not the Day reamer that I sketched here today, it is an entirely different kind of a tool. I have no distinct recollection as to the size of the Day reamer I made. It was about four feet long and I think was for $9\frac{5}{8}$ inch casing. I saw Mr. Fox many times after the shipment of this tool. I have made other tools for him often.

**Testimony of J. W. Russell, Witness Called on
Behalf of Defendant.**

My name is J. W. Russell; age, 58; residence, 310 Sixth Avenue, San Francisco. I am a Christian Science practitioner. At one time I was a manufacturer of well tools. That was from 1885 to 1899. Prior to that time I was a blacksmith. While with the firm of J. W. Russell & Company or the firm of Russell & Edwards we made oil well tools. Also artesian well tools. We made an underreamer for Jere Day. I think we got permission from Day to make that reamer. I think a man by the name of Fox got permission to make it. It was a patented tool. It was made somewhere between 1892 and 1896 to the best of my recollection. We made the forgings for it and Thompson & Evans did the machine work on it. Edwards [715] did the forging on that reamer. I saw him do the work. I think that first reamer was to run inside of 8 inch casing. All the records and details of that reamer were burned up in the fire of 1906. The tool we made is the same as that shown by patent "Defendant's Exhibit Day Patent 403,877." I believe that reamer was shipped to Montague. It was shipped to a man by the name of Fox. I don't remember whether we made more Day reamers than that or not. The cutters were probably about four feet long. Oil well tools that we made in 1885 to 1899 went to Bakersfield, Honolulu—they were shipped all over the State. Some went to Mexico.

XQ. 1. (By Mr. LYON.) This is the only one of

(Testimony of J. W. Russell.)

these reamers that was made at your shop?

A. I would not be sure whether we made two; I am not sure about that; I remember of one.

XQ. 2. If you did make two, both were made for Mr. Fox?

A. Well, I would not be sure of that either.

XQ. 3. You have no distinct recollection whether you made a second one or not then? A. No.

I have no personal knowledge as to where that tool was used by Mr. Fox or what he did with it. Jeremiah E. Day lived in San Francisco. He was in the same line of business. Eastwood was his successor.

Testimony of John Thompson, for Defendant.

Testimony of JOHN THOMPSON, being produced as a witness on behalf of defendant, testified as follows:

My name is John Thompson, age, 63; resident of San Francisco; proprietor of machine-shop. We used to do work for Russell and Edwards, who conducted a blacksmith-shop. We kept a general jobbing shop and did all kinds of work for them. We worked [716] with all kinds of tools, oil well tools, underreamers, bits, etc. We did some work for them on a reamer known as the Jeremiah Day underreamer. Our records are burned up, but I think it was somewhere in the 90's. We did the machine work and [717] they did the forgings. In referring to "Defendant's Exhibit Edwards Sketch of Day Reamer." I recognize the reamer that we made at that time. It shows the dart with the egg-

(Testimony of John Thompson.)

shaped and which spread the cutters. I am sure we made more than one of those reamers but I don't remember just how many. I think it was probably $7\frac{5}{8}$ inch reamer. I think we made the reamer from working drawings. I am sure we also worked for Russell and Edwards on Hoagland reamers.

**Testimony of Joseph Eastwood, Produced on
Behalf of Defendant.**

Mr. Eastwood testified as follows:

My full name is Joseph Eastwood; age, 50 years; residence, San Francisco; occupation, manufacturer. Have been in the manufacturing business since 1891. Was blacksmithing and we made well tools, forgings of all kinds. In 1891 our firm was known as the American Tool Works, Eastwood and Wilson. It was formerly American Tool Works, Day & Pracy Brothers. The full name of Mr. Day was Jeremiah E. Day. I went to work for them in 1888 or 1889. We made well-boring tools, drilling tools, etc. Among those we made underreamers which was an expansion tool. They called it the Day underreamer. I did the forging on one of those tools for them. I made part of the forgings for the Day reamer, yes. We had no machine-shop and the work was sent out for machine work. The Day reamer had two cutters or bits which were fastened together by plates; there was a dart that expanded a tool and there was a coupling or pin connection that connected it on to the other tools. There was a spring that was set over the stem and was connected to the dart. I think it was assembled in the

(Testimony of Joseph Eastwood.)

C. H. Evans Machine Works.

Q. 18. Did you see it after it was assembled?

A. That I could not say. It is likely I did because the tools [718] were almost always shipped back to the shop and shipped to the place of consignment from there, but I would not swear positively that I did.

Q. 19. Do you know whether more than one of these Day reamers was made at the shop of Day & Pracy while you were employed there?

Mr. LYON.—I object to that as leading.

A. Well, I don't know as there was more than one made while I was there, but I know there was more than one made in the shop because there was one sold to me in the shop when I bought it in 1891; but as far as I know I had nothing to do with the making of it.

Witness in referring to "Defendant's Exhibit Edwards Sketch of Day Reamer" states that the reamer is similar to that sketch. It was just a little bit different in the shoulders. The one I refer to was arranged to tie the cutters together by a wire which wire broke when the tool was lowered on to the bottom of the hole. That allowed the cutters then to expand. I offer a sketch of this device as I remember it same being marked and lettered. The sketch just produced by the witness is offered in evidence as "Defendant's Exhibit, Eastwood Partial Sketch of Day Reamer."

I had the patent papers, namely, of the Day patent in my safe until the fire. They burned up.

(Testimony of Joseph Eastwood.)

The tool we made was not exactly like that disclosed in the Day patent but the principles were the same. The patent is exactly the same as we had. In 1891 I bought the old Day shop and everything in it. And I suppose I acquired the Patent at that time. That was in 1891. I made a Day reamer after I bought the shop in 1891 or 1892. I also made one in 1893. The reamers were made from wooden patterns. Yes I had tracings or drawings, of the reamer. The wooden models were burned up in the fire. [719] The cutters were made of tool steel. The string of tools connected to the shank of this Day reamer. When the wire by which the cutters were tied together broke on being brought to the bottom of the hole, the spring raised the cutters to expanded position. The cutters collapsed by contacting with the casing shoe, and until such a time as the box or cavity in the back of the cutters collapsed over the head of the dart. I tried to sell the underreamer but there was not much demand for them. I never found any objection to it when I tried to sell it. After the strike of 1901 we kind of pulled out of the oil-well drilling tool business.

Cross-examination.

XQ. 4. You thought when you purchased this business you purchased the patent that went in connection with this reamer, didn't you?

A. Yes, that is what I thought.

XQ. 5. And your reason for not manufacturing more of these reamers was not because the patent

(Testimony of Joseph Eastwood.)

was outstanding against you, was it, owned by others, I mean? A. Oh, no, I never considered that at all. If I could get orders I would have kept on making them, taking the chances.

XQ. 6. If you don't own the patent to-day that is a surprise to you, isn't that so? A. Oh, no, I would not say that.

Q. 43. Did you ever make the parts of or any of the parts of another of these Day reamers? A. Yes, I made a reamer afterwards, after I bought the place, in the latter part of 1891 or the early part of 1892.

Q. 44. After you bought over this Day & Pracy business did Day continue to have anything to do with it? A. No.

Q. 45. When did he sever his connection with this business?

A. I don't know; it was 1889 or 1890—I think it was 1890. [720]

Q. 46. How many more such Day reamers did you make?

A. I made one, I think it was in 1893.

We were not in shape to compete with the Los Angeles factories on account of concessions we made. That was not true prior to 1901, however.

**Testimony of Charles W. Fox, Being Produced on
Behalf of Defendant.**

Mr. Fox testifies as follows:

My name is Charles W. Fox; age, 62; residence, San Francisco. I am an oil operator, an expert. I have had experience in oil-well drilling and oil-

(Testimony of Charles W. Fox.)

well producing. Have had experience in Pennsylvania oil business about thirty-eight years ago. Have had experience in drilling in California beginning about twenty-eight years ago. First work was in the Topango Canyon, about nine miles west of Newhall. Have used underreamers and am familiar with them. The first underreamer I ever used I believe was made in Pennsylvania, I believe was known as the Fox underreamer. The next was what I called the Edwards and Rusrell; I never knew any other name for it. I used that reamer about twenty years ago about one mile from Montague, in Siskiyou County on what is called the Prather Ranch. The reamer was purchased by Mr. Prather from Edwards and Russell. They had a shop at San Francisco. I would say that was in 1892. I think that is the date as my boy was born that year. We encountered hard rock which we could not make big enough with the regular drill and we had to get an underreamer of some kind, and I asked Mr. Prather to get it. I first saw the reamer in the shop of Edwards & Russell. The next place I saw the reamer was on the derrick at Montague. It might have been a couple of years after I first saw it. Of course those things it is hard to say; it is a long time ago, and I cannot remember. I would have to think the matter over to refresh my memory, but it was along about two [721] years. I said to Edwards then, I made the remark, "I hope to the Lord I never have to use them because they are a very bad thing to use.

(Testimony of Charles W. Fox.)

They get one in trouble; they are hard to run, an awful hard thing to run, they are a kind of thing that makes it very dangerous to run, no matter whose make it is, an underreamer is considered one of the worst tools, the most dangerous to use of any tool that is used in a well. I do not think that I have ever used an underreamer since. I don't think I have ever seen either a Wilson or a Double underreamer."

Q. 46. Please tell us about your use of the Edwards & Russell reamer at Montague, that is, what you did with it and what results you obtained.

A. Well, we reamed about 18 inches, 18 or 24 inches of the hard, very hard shell which I call flint rock, which is as near flint as anything I ever saw; and after we got through the shell, so that the reamer would swing clear, we had no trouble then to run our casing on down, and we had no more trouble after that, as long as I stayed there; I did not stay there but a short time after that.

Q. 47. How long did it take you to drill that shell? A. It took us nearly four days.

Q. 48. How long did it take you to ream through it?

A. It took us about 18 hours work—just about 18 hours.

Q. 49. Do you remember what size casing you used in that well? A. 5 $\frac{5}{8}$.

Q. 56. How did the general formations you encountered in that well at Montague compare with formations that are found in other fields, such as

(Testimony of Charles W. Fox.)

the formations in the Kern County fields, with which you have stated you are familiar?

Mr. LYON.—Objected to as immaterial, no foundation [722] laid, the witness not having qualified to answer the question.

Mr. BLAKESLEE.—Attention is called to the fact that the witness has testified to examining and reporting on oil-bearing territory, including those in the Kern County fields.

The WITNESS.—Just about the same.

Q. 57. What, if anything, can you tell us further about your use of this Edwards & Russell reamer, with respect to the nature of its service? A. Well, so far as I myself individually am concerned, if I had business and had reason to use an underreamer of that kind, why, I would as soon use that underreamer as any I ever saw.

Q. 58. Did you have any trouble getting this reamer into the hole?

Mr. LYON.—Objected to as leading.

A. Not a particle.

Mr. BLAKESLEE.—Q. 59. If you had any trouble in connection with using this reamer, please tell us about it.

A. We had no trouble at all, whatever.

I think the reamer when it was expanded to full size was about 7½" across the cutters. I think the reamer was about four feet over all. We carried the casing about 1484 feet. I never saw that reamer again.

Q. 81. Please look among the miscellaneous

(Testimony of Charles W. Fox.)

papers on the desk here containing letters, sketches, legal papers and the like and see if you find among them anything which in your opinion or to your knowledge bears any resemblance to the Russell & Edwards underreamer about which you have testified.

Mr. LYON.—Objected to as leading, not the proper method of proof, and tending to educate the witness for his further testimony in this case, and as incompetent and not the best evidence.

A. That looks like it. (The witness designates the drawing [723] “Defendant’s Exhibit Day Patent No. 403,877.”) This here is another.

Mr. BLAKESLEE.—Q. 82. Another what?

A. Another drawing that looks like the Edwards very much. (The witness refers to “Defendant’s Exhibit Edwards Sketch of Day Reamer.”)

Q. 83. Referring now to “Defendant’s Exhibit Edwards Sketch of Day Reamer,” are you enabled to point out on this sketch anything pertaining to the Edwards & Russell reamer to which you have testified?

A. Well, in fact, all this construction here is, as near as I can remember it, an exact sketch of the Edwards reamer.

Q. 84. Please point, if you find it there, to the part you refer to as a wedge?

A. This here. (Witness points to part B).

Q. 85. Please now point, if you find it there, to the part you refer to as the cutters or knives?

A. This here. (Witness points to the part A).

(Testimony of Charles W. Fox.)

Q. 86. By referring to this sketch are you enabled to state anything further with regard to the Edwards & Russell underreamer you used?

A. No, I cannot, nothing else; only it looks, it is just exactly the same in every respect, as near as I can remember it.

Q. 87. By referring to this sketch, are you able to tell me how the parts worked in a general way in that reamer?

A. Well, when this B is up in there (witness points to pocket E) when the wedge is up in there, B, why, then the wings or cutters are closed so that they enter the casing; then when it gets down low enough so that the cutters open out under the casing, then this drops down and holds them out and holds them in place. (In making this last answer the witness when he refers to "this" places his pencil on the part B of "Defendant's Exhibit Edwards Sketch of Day Reamer.")
[724]

Q. 88. Do you recollect anything further as to how these movements of the parts were caused?

A. Well, when you pull the reamer out, of course this comes back in here. (Witness points to the part B and to the pocket E.)

Q. 89. Have you anything further to say about the method of operation of this reamer, from your recollection?

A. No, there is nothing else; the reamer done its work perfectly in every way, shape and form, so we ran our casing on down, we had no trouble with it in

(Testimony of Charles W. Fox.)

the least. While in Pennsylvania a day I used the Luther Underreamer.

Cross-examination.

XQ. 32. You never used this underreamer but on the one occasion, I suppose? A. That is all.

XQ. 33. How long did the underreamer job take you—do you recollect now?

A. Nearly 18 hours, somewhere thereabouts.

XQ. 34. The tool was in the hole all that time, was it? A. No, we had it out twice.

XQ. 35. For what purpose?

A. To see if it was sharp or if anything was wrong with it.

XQ. 36. That was the only underreamer that you had up there at Montague? A. Yes. [725]

TESTIMONY TAKEN IN OPEN COURT.

Testimony of Frederick W. Jones, Called on Behalf of Defendant.

Mr. Jones testifies that he is 53 years old; at present farmer but a machinist by trade; residence, McFarland, Kern County, California. Was an employee of the Union Oil Company in 1891 in their shop at Santa Paula, was a machinist and was prior to that time, in charge of that shop. They manufactured Oil Well Tools and did general machine-shop work. I don't know just the exact date, but I think I left their employ sometime in July of 1901. The name of the concern when I left it in July, 1901, was the same as when I went with it. Right away after leaving them worked in partnership with George L.

(Testimony of Frederick W. Jones.)

Skinner and conducted a machine-shop at Santa Paula. That firm's name was the Santa Paula Tool Works. It was in July, 1901, Mr. Edward Double was in charge of the Union Oil Tool Company's shop when I left in July 1901. Double took charge of the shop on July 5, 1897. Just prior to leaving their employment I think I was doing general work in the shop and assisting in most all of the work that took place.

A. 26. I expect I had better state the reason that I gave up the foremanship, and then you will understand it better.

Mr. LYON.—Objected to as not responsive to the question.

The COURT.—Overruled.

A. I was incapable of running the business, as my education was lacking as far as books was concerned, and I admitted the fact to the head of the concern and requested that the business be turned over to some other man.

Q. 27. (By Mr. BLAKESLEE.) What part of the work as foreman was it that bothered you?

A. The books part of it and attending to the business in general.

A. 29. I will explain it so that you can see the situation clearly. When I was employed by this shop first I was the only [726] machinist there. The shop was a very small matter and after years it grew and there was more men employed and there was a great deal of estimating and figuring to do, and I was not capable of giving estimates on work and giving exact figures and things, so I felt that I could not attend to

(Testimony of Frederick W. Jones.)

that end of it. I told the officials that my lacking in that line—I felt I was taking the right course in wanting to resign the position—and then they sent East and got Mr. Double. And to prove this, I was still employed by the company in the shop for years afterwards. But I went back onto the lathe and worked as other men did in the shop, and it was at my own request.

Q. 30. (By Mr. BLAKESLEE.) Did you do any drafting at that shop?

A. Yes, I did considerable drawing, as I had taken a course in mechanical drawing years before, and I followed that up considerable and I had lots drawings previous to that and I made several drawings after Mr. Double had taken charge. In fact, I assisted him in every way in that line that I could, and helped him out.

Q. 31. Did Edward Double make any drawings in connection with the shop work while you were in that shop?

Mr. LYON.—Objected to as leading.

The COURT.—Overruled.

A. Well, not to any great extent, I don't believe. He admitted to me once that he was not capable of making drawings to speak of, and he left a good deal of that work for me to do and figure out.

Q. 32. (By Mr. BLAKESLEE.) What work did Edward Double do in that shop while you were there?

Mr. LYON.—Objected to as incompetent, no foundation laid, the witness not having qualified to answer the question.

(Testimony of Frederick W. Jones.)

Mr. BLAKESLEE.—He states he was there.
[727]

The COURT.—The objection is overruled.

A. He of course took command and instructed in a general way the work to be done, and took up the business where I left off, and he proceeded to establish a system of keeping accounts and keeping books that I was not capable of doing.

He did no work in the machine shop on the tools. No one else did any drawing or drafting work in that shop that I know of, except myself.

Q. 37. State, so far as your knowledge can permit you, what Mr. Double's general fund of knowledge was when he came to that shop to be foreman, regarding oil well tools and underreamers.

Mr. LYON.—Objected to as incompetent; no foundation laid, the witness not having qualified to answer the question. There is nothing to show that this witness knew anything of Edward Double till he got there.

The COURT.—That is true, but the court understands the answer in connection with the situation.

A. Mr. Double had been used to oil-well work previous to the time that he came to the Santa Paula, and he understood considerable about the business. But the ways and tools in California were somewhat different from what they had been using in the East, on account of the different formations and different things they had to contend with, and of course I was of great assistance to him in that line, helping him out, and doing what I could to keep things going in

(Testimony of Frederick W. Jones.)

that line. Of course, his knowledge of the tools in California at that time was not what it is now.

Q. 38. (By Mr. BLAKESLEE.) During those years, while you were with that company and Mr. Double was there as foreman, did he give all his time and close attention to the work of that shop?

A. Well, a great portion of it. There was times when he [728] was not around the shop, of course, and at such times he generally left me in charge and told me about the work that had to be done right away, and requested me to look after it.

A. 41. I might say that things didn't go just as smooth as they should at several times, and, of course, Mr. Double made mistakes like other men. But I considered that he succeeded fairly well in a business which the business proves at the present time, that he was a good business man, at least, and it has grown from that time on. I considered that he made a fairly good success. But on the start it looked to those around at that time that he was going to make a failure of it.

A. 42. Whenever anything new came into the shop, of course Mr. Double generally consulted me as to those things, as a person naturally would, because I had been there longer and knew more about those things. Things would come in that Mr. Double had never seen before, and when such things did come in he always asked my advice about such things and the best way to go about the job, which was very natural.

We had underreamers to deal with ever since I can remember anything about the oil well business.

(Testimony of Frederick W. Jones.)

About 1900 we commenced to manufacture underreamers for the market. Prior [729] to that time we had repaired a great many underreamers. We repaired Austrian underreamers, Swan underreamers and several other makes. Mr Double did not do any of the repairing himself. I was in daily attendance in that shop. The first reamers we manufactured was the Austrian underreamer. Then we got up a reamer of our own known at the present time as the Double reamer.

Q. 51. You say "We got up an underreamer." Whom do you include in that word "we"?

A. I say "we." Me and Mr. Double of course was there, and we worked in unison in such things more or less and when [730] that was brought up we worked together on it.

Q. 52. How did you come to get up this underreamer?

A. The object, as I remember it at the time, was that they had brought the underreamer from the East, known as the Swan, and at that time they commenced underreaming, and it was necessary that we should have an underreamer to hold the other business of the shop, and this led us to think on the underreamer question and to make one of our own, which we tried to make superior to any of the others, on account of the other business.

The Swan reamer was like the brass model, and exhibit in this case, which Swan reamer was manufactured by the Leidecker Tool Company, Marietta,

(Testimony of Frederick W. Jones.)

Ohio, and was sold in California by the McFee Supply House.

Mr. BLAKESLEE.—In connection with this testimony we again offer in evidence this exhibit “Partial Model Swan Underreamer.”

The brass model of Double underreamer on exhibit I recognize as the second reamer that was manufactured at the Union Oil Tool Company’s shop at Santa Paula. That was called the Double reamer.

By Mr. BLAKESLEE.—We again offer in evidence in connection with the testimony of this witness “Defendant’s Exhibit Small Brass Model of Double Patent Underreamer” with lower dovetails out.

A. 58. There was a party by the name of Gilson brought a wooden model there for us to manufacture and this model was known as the Brown patent, and when it was brought there it was in the office and Mr. Double called me in to look it over, and asked me what I thought about it, and he said they were going to try to manufacture them. I told him that I didn’t think that it could be a success in the way it was made on account of [731] different things, and so we decided to make an improvement on it.

A. 59. I will state the reason that we did not take up the exact manufacture of that model. The reason was that there was a plate held on the side with bolts, and I suggested that those bolts would not stay there; that they would either be sheared off or become unscrewed in the well and the internal parts of the reamer would be lost in the hole, and it was almost impossible to manufacture the machine out of iron or

(Testimony of Frederick W. Jones.)

steel the way it was made, unless we went to work and got up a different type of reamer and manufactured one of those and it didn't prove to be a success.

Q. 61. (By Mr. BLAKESLEE.) To your knowledge, what was the first thing done at that shop with this Brown reamer when it arrived there?

A. There was never a reamer made entirely after that model.

Q. 62. Did you examine that model there?

A. I did.

Q. 63. How did you come to examine it?

A. Mr. Double called me into the office and showed it to me when Mr. Gilson brought it there.

Q. 64. Was it taken apart in your presence?

A. Yes, sir.

Q. 65. Can you tell us briefly what it looked like inside?

A. Well, it was constructed with a block and spring attached to the upper end of it, and the cutters pulled down over a tongue that held them down while they were passing through the casing. As soon as they passed through the casing the spring actuated on the cutters and brought them back over the tank and spread them out.

Q. 66. Can you state what was said by you or Double or [732] both at the time that this Brown device brought up by Gilson was shown you in Double's office?

A. Well, it is pretty hard for me to remember all the details of the conversation, but the principal feature of it was whether we could manufacture that

(Testimony of Frederick W. Jones.)

reamer the way it was or whether we could not, and I tried to explain to Mr. Double that it couldn't be made that way, and if it was made it would not be a success when in the well. That was the first thing we had to decide. We didn't want to make anything and send it out as a failure if we could help it.

Mr. Double asked me the question whether it would work or not. And that is what I told him.

A. 69. This reamer here is the one that looks similar to the Brown patent as it was known at that time. Here is the plate that I had reference to that was fastened on with screws; and in the motion of the tools working in the well, this plate would work loose and shear these bolts off, and the consequence is that the internal parts would fall out and be lost in that hole. That is the principal feature that we did not manufacture that reamer.

Mr. LYON.—I suppose you mean that that is the reason that you couldn't make it?

A. No. The principal reason was the interior work—to work that model out—with the tools we had at that time it was almost impossible to make it that way.

The model to the best of my recollection is the complete model of the Brown device or reamer. It is at least similar. To the best of my knowledge, however, this is an exact model. This model appears to me to be the same as shown by Brown Patent #687,296.

(Complainant's counsel objected to all questions relative to this Brown model. Defendant's counsel

(Testimony of Frederick W. Jones.)

stated it was "simply [733] showing the genesis of the patent in suit." The Court.—This witness has established that this Brown device was a failure. The Court is looking at it as indicated a while ago that it is developing this other invention. Mr. Blakeslee.—"We are not arguing that the Brown patent is pleaded in this case, because it is not." (Page 26.)

In addition to the Austrian underreamer and Swan reamers and Brown reamers, the Brown model which we had knowledge of at the time of inventing the first so-called Double reamer we also knew of the reamer shown by the cut in the Oil Well Supply Company's Catalogue. It was known as the Canadian reamer. I had one of those catalogues at that time. I believe I had it in the office at that time. Probably had more than one of those catalogues. The Canadian reamer was something similar to the Brown as it had the locking device on the cutters similar to it. The upper ends of the cutters were pivoted on a spring the same as the Brown. The action of the cutters was similar to that of the Brown.

(Let the records show that the witness points out Defendant's Exhibit Oil Well Supply Company's Canadian Underreamer, stipulated January 18, 1913, Canada 4½ Underreamer. We again offer this exhibit in evidence in connection with the testimony of this witness.)

The catalogue I got which showed the Canadian reamer I got from R. H. Herron Company of Los Angeles. The cut of that reamer is shown on page 117.

(Testimony of Frederick W. Jones.)

We offer in evidence on behalf of defendant a catalogue of the Oil Well Supply Company just put before the witness, independent of the attached papers, Defendant's Exhibit Oil Well Supply Company's for the year 1900, identified by the witness Jones.

At the time we were designing a new underreamer we discussed [734] all the underreamers that were made, more or less, at that time. We discussed the Austrian underreamer also this Canadian underreamer and there were other reamers that I cannot remember now, but I remember their construction more or less but don't remember their name. I don't believe I can definitely state the substance of any such conversation.

A. 107. I think the first thing that was done was to make some kind of a drawing as to what we wanted.

To the best of my knowledge it was me. I made such a drawing. It was just a pencil drawing and showed the general construction as near as we could get at it at that time. Of course there was some changes more or less, getting a drawing before the thing was completed.

A. 110. It represented, as near as we could get at it, the first reamer that we manufactured there—the one with a detachable block and the spring attached, something similar to the Brown—the spring attached to the cutters and the rod actuating it between springs. The cutters moved up and down and expanded over the block.

A. 112. The thing came down with a tilting motion,

(Testimony of Frederick W. Jones.)

tilting of the reamer, or, in other words, the block.

A. 113. They contracted inwardly when they were close together. When they were going down the casing, and when they expanded they spread out.

I do not know what became of the first drawing I made. The drawing I first made of that first reamer was used around the shop during the manufacture of that tool. My recollection is that Mr. Richardson saw that drawing. His name is John Richardson. He lives in Santa Paula at present.

Q. 123. Did you show it to anybody else?

A. Well, I don't remember. I expect though that there were several that did see it, but to my knowledge I couldn't just name them.

The drawing was in the shop. It was for the purpose of [735] information to manufacture the tool.

A. 126. Well, the first thing was that the blacksmith had to make the forging, and it went from there to the machine-shop.

There were four or five blacksmiths there at that time and I believe Mr. Richardson did some of the blacksmith's work. I did some of the work on that reamer myself. I worked on the body of it, the main forging that carries the cutters. The tool was all made in that shop.

A. 136. Well, as I said before, there was a great deal of cutting and trying about it—about the first one.

Q. 138. What, if anything, did you have to do with the cutting and trying of it?

(Testimony of Frederick W. Jones.)

A. I don't remember just now, it is so long ago and it is hard for a person to keep those things in his mind. That is, the details of it.

Q. 139. Do you know anybody else that had anything to do with that? A. With what.

Q. 140. With cutting and trying, as you say.

A. Well, I don't, definitely.

Q. 141. What did the cutting and trying have to do—what device had to be tried out and worked over or changed?

A. Well, it was to get the proper expansion and proper contraction and have it so that it would come out of the hole freely without any trouble.

Q. 142. Was that changing parts or changing the form of the parts and dimensions?

A. Well, a little of both, I believe.

Q. 143. Do you know of anybody else who had anything to do with making up the drawing which was used for information in making this reamer?

A. No; I do not. [736]

Q. 144. Did Edward Double have anything to do with that drawing or the making of it?

A. Other than seeing that the thing was tried out after it was completed—after the drawing was completed.

Q. 145. Did he make any suggestions with respect to that drawing?

Mr. LYON.—That is objected to as calling for the conclusion of the witness.

The COURT.—The objection is sustained.

Q. 146. (By Mr. BLAKESLEE.) Did he make

(Testimony of Frederick W. Jones.)

any suggestions to you with respect to that drawing?

Mr. LYON.—The same objection. That is not the proper method of proving a conversation.

The COURT.—Overruled.

A. To the best of my knowledge and belief, he did.

Q. 147. (By Mr. BLAKESLEE.) What did he suggest?

A. Well, as to details of that I don't remember.

Q. 148. To your knowledge did he have anything to do with the making of the reamer following this drawing? A. Well, actual work, I think not.

Q. 149. Who, as a matter of fact, bossed the making of that reamer?

Mr. LYON.—Objected to as calling for a conclusion of the witness and as leading.

Mr. BLAKESLEE.—There is a boss in every shop.

The COURT.—Overruled.

A. Mr. Double was the foreman there and would naturally oversee the work.

Q. 150. (By Mr. BLAKESLEE.) As to this particular reamer, was there anybody that paid particular attention to following out the drawing?

Mr. LYON.—Objected to as calling for a conclusion and [737] not for a statement of fact.

The COURT.—Denied. Overruled.

A. We were more or less interested in the thing, all of us, and we took an active part in seeing that the thing was carried out right, myself included.

Q. 151. (By Mr. BLAKESLEE.) Can you mention any one thing which Mr. Double suggested to

(Testimony of Frederick W. Jones.)

you in connection with the drawing which you say you got up before this reamer was made.

A. Not at the present time, I don't remember.

I made the drawing in the office of the company. There were different people passing in and out at different times.

I took a course in mechanical drawing and took a diploma from the English Government.

Q. 155. Did Mr. Double to your knowledge make any drawings at that time of anything that was made in the shop?

A. Yes, I think he did. I think he took up drawing somewhat and done a little of it. But he stated to me that he didn't know much about it and would like to learn, and I assisted him in various ways in things that were necessary in carrying on the business.

Outside myself I don't know of any one who suggested any actual changes which was made in tools and devices, or made over such devices and tools as had to be altered in that shop in 1901.

A. 157. I believe I have already stated the necessity of it previous to this; that the underreamer business was getting to be quite a business and there was a great demand for them, and the party that had the underreamers to sell generally sold the other tools, and therefore we discovered the fact that if you did not have a good underreamer you would lose considerable trade in other lines and that parts of the underreamer was very necessary.

I believe our principle competitor at that time was

(Testimony of Frederick W. Jones.)

[738] the Leidecker Tool Company. They manufactured the Swan underreamer. I don't know just exactly what was said by Mr. Double and me when we discussed getting up a new reamer in 1901. I cannot state the substance of such conversation.

Q. 162. (By Mr. BLAKESLEE.) What was said at the time you discussed with Mr. Double in 1901, if anything, when it was first done, with respect to getting up a new reamer at that shop? [739]

A. We both worked in conjunction together more or less on the question, and we decided that it was shown that the one had the best inventive powers, his ideas were generally accepted and it proved the same with this.

Mr. LYON.—We move to strike out the answer from the record on the ground—

The COURT.—It will be stricken out as argumentative.

A. I don't remember just exactly what was said.

The underreamer disclosed by U. S. Patent #795,-197 issued to Edward Double for an underreamer is similar to the first reamer we got up at Santa Paula. I did not apply for a patent on that reamer for the reason that I thought all the points connected with it, or nearly all, had been previously used in other underreamers. The feature of drawing down and locking around the end of the reamer, to hold the cutters in place while passing into the casing was old. The system of expansion and contraction on this one appears to me to be the same idea as used in the Canadian reamer.

(Testimony of Frederick W. Jones.)

By Mr. LYON.—We do not pretend that in any one of the particular elements there was any novelty alone. Springs were old; spring-actuated rods were old; not only in this patent but in the patent in suit there are combinations of parts and these things separately considered are old.

The COURT.—With that concession, is it necessary to go into these parts?

Mr. LYON.—That is an irrebuttal presumption of the law arising from a claim of a combination. We could not be heard to deny it if we wanted to, and the mere question whether a spring rod like this is old is an admitted fact; we don't claim simply a spring and a rod.

The COURT.—Your concession simply goes to the spring and to the rod? [740]

Mr. LYON.—Certainly; and each one of the elements separately considered is old. Not as a combination, but each separately considered is old.

Mr. BLAKESLEE.—Does that go over the portion which the cutters tilt?

Mr. LYON.—Each portion of the combination separately considered is old. I cannot state it more definitely.

Mr. BLAKESLEE.—Was old at the time?

Mr. LYON.—Yes; was old, the mere fact that we claim a combination is evidence of that.

Mr. BLAKESLEE.—Not necessarily, but the concession we are glad to have.

A. Similar combinations were in use at that time. Part of the combination was used on the Swan

(Testimony of Frederick W. Jones.)

reamer and another part of it was used on the Canadian reamer. The actuating rod was similar to that reamer, and the collapsion of the cutters on the Canadian.

In designing the first reamer I was guided somewhat by the Brown underreamer as shown by Patent #796,197. The system of drawing down the cutters and locking them to go into the casing was one of the features. It gave the cutters a kind of tilting action.

Q. 186. Did you ever devise or get up or make any other kind of an underreamer after that time?

A. Yes, sir.

Q. 187. When, in the first instance?

A. I made a small model of a reamer about that time, of a different type.

Q. 188. Can you fix the time by a month?

A. No, I could not.

Q. 189. Can you give a date before which you made such a model? [741]

Mr. LYON.—Objected to as calling for a mere conclusion. The witness said he could not fix the month.

The COURT.—Overruled. He is asked to fix it by reference to some other time.

A. I only can remember that it was about the time that my mind was pretty well occupied with underreamers, and it was along in that time of the spring and summer of 1901.

Q. 190. (By Mr. BLAKESLEE.) Was it before

(Testimony of Frederick W. Jones.)

or after you left the shop of the Union Oil Tool Company?

A. This model I speak of I believe to the best of my knowledge,—

Mr. LYON.—I object to that on the ground that the witness is not testifying to anything but belief.

The COURT.—Well, it is one way. It is necessarily referring to his recollection of something that he did personally.

(Overruled.)

A. It was at the time—it was before I left the employ of the company.

I do not know where that model is. Have not seen it for several years; I have not attempted to find it. The last I saw of it was in the shop of Mr. Skinner, Santa Paula. Left that shop in the fall of 1902. That shop is not in existence. Part of that shop is in Los Angeles and is known as the Mills Iron Works.

The model was made of wood and was about 6" long. The lower point was rounded on both sides with dovetails and cutters moving on a circular plane on the lower end of the reamer. The cutters were actuated by a spring and a rod similar to the other reamers in question. The wooden model in this courtroom is an exact duplicate of the original model. This wooden model was made by Skinner and Jones in Santa Paula shops. I being the [742] Jones of that firm. It was made along in the winter of 1901, if I remember right.

These cutters are pulled down with a hook in the

(Testimony of Frederick W. Jones.)

dole and drawn down to the end of the casing; as soon as it was brought down through the casing it was released and they spread open that way. The dovetails allows it to run in. That is on a segment of a circle, and these cutters are slipped in. The cutters have dovetails, just the same as the Swan except that this one is on a circle and the Swan is on a straight plane. The backs of the cutters are segment of this circle. By dovetails I mean the web on the cutters which fit into those slots and holds the cutters in place. The dovetails are on a circular plane. The cutter does the reaming, the inward thrust of the cutters is taken up by the shoulders principally and by the face of the dovetails. The upper or inthrust is taken up at the upper end of the shoulder of the cutter, or upper end of the cutter. The small wooden model which was like this large one I made at home. I had it in my pocket while I was in the shop at work. I made no secret about it, I do not know to whom I did show it. I expect there were several of them seeing it. I don't know but what Mr. Double saw it; I believe he did. It is the best of my recollection I did see it,, and I showed it to him. That was before I left the Union Oil Tool Company's shop in July of 1901.

Defendant offers in evidence the wooden model just produced and identified by the witness, as "Defendant's Wooden Model of Jones Underreamer."

Defendant offers the underreamer device shown by witness to be introduced and marked "Defendant's Exhibit Fred W. Jones Reamer, Type 2."

(Testimony of Frederick W. Jones.)

By Mr. BLAKESLEE.— [743] Will ask that this device be changed and marked to read “Fred W. Jones Model Reamer Like Defendant’s Exhibit Jones Wooden Reamer Model.”

I remember when I showed this model to Mr. Double he made the remark that there was all kinds of reamers on hand. That has just come to my mind. He said that in the shop at Santa Paula. I think that conversation occurred in June of the year 1901 or something like that; I cannot tell the exact day and date when this was. That is the best of my recollection. I don’t remember whether the small model which I showed to Edward Double was completed and shown to Edward Double before the Brown reamer was brought to that shop by Mr. Gilson or not. We made several reamers of the type disclosed by the wooden model, and sold them. That was in 1901 and ’2.

Q. 243. Now, to your knowledge, after this under-reamer like the drawings of patent No. 796,197 was completed, do you know of any other kind of under-reamer that was made in the shop of the Union Oil Tool Company at Santa Paula before you left that shop?

A. I don’t remember that there was any one of them finished, but there was another one there under discussion, before I left.

Q. 244. Can you state how that compared with the reamer like this patent just referred to?

A. I would have to see the drawing. I can’t tell by the numbers.

(Testimony of Frederick W. Jones.)

Q. 245. How it compared with the drawings of that patent. (Hands patent to witness.)

A. Which reamer have you reference to?

Q. 246. The reamer which you say was commenced prior to the time you left that shop.

The COURT.—You said it was under discussion.
[744]

A. It was not like this, in any way. It had dovetails on the sides to hold it in place, but the locking device to hold it in position while entering the casing is just the same.

It held the cutters in place. The body was made different so as to make the cutters longer at the shoulder. That reamer was constructed a sub, another part which screwed on the upper end. That sub had to be taken off when the reamer was taken apart. Don't know whether any reamers like that were made prior to 1901, prior to the time I left the shop in 1901. Reamers which were later made in that shop were very similar to the reamer that was under discussion at the time I left the shop. I have seen an underreamer made in accordance with the drawings shown in patent #734,833. They were made by the Union Oil Tool Company. First one was made in 1901, at Santa Paula. Not sure whether that reamer was made before I left or after.

Q. 265. Had you at any time in the year 1901 discussed with anybody such underreamers, namely, those similar to drawing of United States patent No. 174,833? A. I don't remember about that.

Q. 266. Referring particularly to the dovetail part

(Testimony of Frederick W. Jones.)

of such reamers like the dovetail part of the cutters shown in patent No. 734,833, did you at any time in the year 1901 discuss such dovetail parts with any person?

Mr. LYON.—Objected to as leading. He has already told what he did in regard to the dovetails in his own models.

The COURT.—The objection is overruled.

A. I discussed with Mr. Double more or less.

The COURT.—When was that?

Mr. BLAKESLEE.—In the year 1901. Can you state what part of the year 1901, approximately?

A. No, I cannot.

Q. 267. Can you state whether it was before or after [745] you left the shop of the Union Oil Tool Company?

Mr. LYON.—Objected to as leading and suggestive.

The COURT.—Overruled.

A. Well, it must have been before I left the shop.

Q. 269. Can you state the substance of that discussion?

A. I can't go into details as to the conversation at the present time, but it was to the effect that such would have to be used to hold the cutters in place.

Q. 269. Can't you recollect who said that?

A. I think that suggestion was made by myself.

(Copy of United States patent #796,197 offered in evidence.)

I believe drawings were made which showed or attempted to illustrate the dovetails on the body and

(Testimony of Frederick W. Jones.)

cutters of the reamer like in the drawings of United States patent #734,833. Those sketches were made by myself to the best of my recollection. Those drawings were on exhibition. Anybody could have seen them. They were in the office of the Union Oil Tool Company's shop; I do not recollect showing them to anybody. They were on a desk used by Mr. Double and others; I don't remember what time in 1901 I made those sketches of the dovetailed parts. I made those drawings before I left the shop of the Union Tool Company.

Q. 285. I call your attention to the notch key No. 17 shown in Double patent in suit No. 174,833, and ask you if you recollect anything concerning such key in connection with the discussions about the reamer made like that patent?

Mr. LYON.—We object to that on the ground it is assuming a fact not testified to by the witness, that there was ever any discussion about a reamer that was made like that. The most he ever said was that there was a discussion about a contemplated reamer.

Mr. BLAKESLEE.—He said afterward they were made and sold. [746]

The COURT.—The objection is overruled.

A. I know there were such keys made.

The COURT.—You were asked about a discussion.

A. Well, I don't remember that one feature—any particulars about it.

Q. 286. (By Mr. BLAKESLEE.) Have you any recollection as to its being made, by whom it was

(Testimony of Frederick W. Jones.)

made, or who furnished the information for making it? A. No.

Defendant offers in evidence for the purpose of illustration, wooden model in accordance with drawings U. S. patent 791,697, and ask that same be marked "Defendant's Exhibit Wooden Model of Double Patent, #796,197.

This is received simply for the purpose of argument.

The Swan reamer to which I have referred is like the one I point out here among these exhibits.

Q. 288. With respect to any of these reamers which you have testified about as having been discussed in the shop of the Union Oil Tool Company in 1901, namely the reamers for which you made sketches, reamers which were made or commenced at that shop, can you state from recollection any discussion in which Mr. Edward Double suggested certain features of construction or any features of construction or made any proposed changes in construction, and if so, please state the gist of such conversation.

Mr. LYON.—That is objected to as calling for the conclusion of the witness.

The COURT.—Objection overruled.

Mr. LYON.—And incompetent and not a proper method of proving a conversation.

Mr. BLAKESLEE.—I asked if there was a conversation, first. [747]

The COURT.—Answer the question.

A. No.

Prior to the time I testified in the other case,

(Testimony of Frederick W. Jones.)

namely the suit Elihu C. Wilson, versus Union Tool Company, I had a conversation with Mr. Lyon. It was two or three weeks before I testified in that case. That was last summer, yes. That occurred at my ranch at McFarland, my wife and Mr. Youngken and Mr. Lyon were present. I refer to Mr. Lyon, the attorney in this case. Mr. Lyon wanted to know if I had any models of any reamers, and I told him that I had one, but did not exactly know where it was. Then he asked me if I could find it, and I told him I thought I could. We got into an automobile and went to home ranch, and I found it and he asked me if I recognized it, and I told him I did, and that it was a model of one of those reamers made on the floor there. It was like reamer "Defendant's Exhibit Fred W. Jones type #1," so marked, being marked #A-4. We talked for several hours and I told him I did not want to take the matter up, because I did not have the time, and too busy, I wanted to keep out of this trouble, if I could. That I was out of the machinist business for all time and eternity, and I did not want to mix up with it. I told him if he wanted me to keep out of it and give me two thousand dollars I would keep out of it and I would not testify on either side and he made the remark that he could not do that, but he would give me two hundred and fifty dollars and I told him it was not worth bothering with. I suppose the \$250 was to be given me if I did not testify in this case, I don't know what else. I did testify in that case but I don't know whether I was testifying for him, or anybody else. I tried to

(Testimony of Frederick W. Jones.)

tell the truth, what I knew about it, whether any benefit to him or anybody else, I don't know. I received train fare and my day's [748] wage for testifying on behalf of defendant in that case. I received nothing in consideration of my testimony, no. I have received only regular expenses for testifying in this case. I have been promised nothing by anybody for testifying in this case, or any other case. I did not receive the two hundred and fifty dollars which Mr. Lyon offered me for not testifying in the other case.

Q. 316. Did you know that Edward Double had applied for a patent, namely, for U. S. patent 734,833, being the patent in suit, at the time it was applied for?

A. No, sir, I didn't know he was taking out a patent on it.

It was in November, the fall of 1901 before I found it out. I happened over there one day and saw the patent draftsman making a drawing in his office, and I saw that it was a Patent Office drawing and I knew then that he was applying for a patent on it. There was nothing said by me to Double about it at that time. It is my recollection that Double was present at the time the draftsman was working on those drawings.

I wish to state here, I made a mistake in my testimony at Bakersfield; I had stated in that testimony that I had never received any letters from Mr. Lyon, as their attorney, but after, I remember of receiving a letter from Mr. Lyon stating that I was not to

(Testimony of Frederick W. Jones.)

manufacture any more reamers, that it was an infringement of a patent that the Union Tool Company controlled. I don't remember the exact date, but it was sometime after we commenced the manufacture of the reamer with the round nose, with the circular cutters, like reamer in evidence, Defendant's Exhibit Wooden Model Jones Underreamer. That was in 1902 I believe. I didn't do anything about it. We quit manufacturing those reamers at that time. We did not want to get into a suit. We did not have no money to throw away for courts. [749]

Q. 334. What invention did you then understand was discussed in that letter or notification?

Mr. LYON.—That is calling for a conclusion.

Mr. BLAKESLEE.—Must have referred to some invention.

The COURT.—Objection sustained.

Q. 335. (By Mr. BLAKESLEE.) What was the substance of that letter?

A. Well, I have already stated that the substance of it was that we was infringing on a patent of theirs, that we should not manufacture any more of the reamers.

Q. 336. Was it an underreamer patent? A. Yes.

Q. 341. (By Mr. BLAKESLEE.) Were you from that letter able to understand what reamer was referred to by the letter? A. Yes, certainly.

Q. 342. What reamer was it?

A. It was reamers that they were manufacturing.

Q. 343. And what reamer was that?

A. The reamer that was—that has just been on ex-

(Testimony of Frederick W. Jones.)

hibition, exhibited here, the second reamer that was made. I cannot give you the numbers of it.

Q. 344. You mean reamer like Double patent in suit, No. 734,833? A. Yes.

Q. 345. I call your attention to the fact the date of that patent is July 28, 1903, and ask you if that in any way refreshes your recollection as to when such notice was received?

Mr. LYON.—We object to that on the ground it is attempting to impeach the witness on his own testimony, and leading. The date of this patent hasn't anything to do with that notice, so far as the evidence is concerned.

The COURT.—Objection sustained. [750]

Q. 347. (By Mr. BLAKESLEE.) Can you mention any other reasons why you did not resist the notice you received by that letter?

A. No. That was the only one, that we was not financially able to stand a suit.

Q. 348. Did you know at that time that there was any Double patent invention— A. Yes.

Q. 349. (Continuing.) Which he could properly threaten you about? A. Yes.

Q. 350. What was it that you thought he could properly threaten you about?

A. The patent under question now.

Q. 351. For what reason?

A. He had more money than I did.

Q. 352. Did you believe at that time he was the inventor of that reamer? A. No.

Q. 353. And you were forced to stop manufactur-

(Testimony of Frederick W. Jones.)

ing those reamers due to that threat?

Mr. LYON.—That is objected to as leading.

The COURT.—Objection sustained.

Q. 354. (By Mr. BLAKESLEE.) Was there any other reason why you ceased making your reamers, other and beyond such threats by that notice?

A. Not to my knowledge.

My only reason for not resisting the notice of infringement of Double's Patent was because we did not have money to stand the suit.

Q. 355. At the time you received that threat by letter or notice, did you know what the rights of an inventor were with [751] respect to any invention produced by him and patented by another if he were employed or under the supervision of such patentee when such invention was made?

Mr. LYON.—That is objected to as leading and incompetent, calling for the conclusion of the witness.

Mr. BLAKESLEE.—Finding out what he knew as to his rights.

The COURT.—Finish the question.

The WITNESS.—No.

The COURT.—Have you finished your question?

Mr. BLAKESLEE.—Yes.

The COURT.—Objection overruled.

Q. 356. (By Mr. BLAKESLEE.) Do you know now? A. Yes, sir.

The reason I did not apply for a patent on that underreamer which I have shown in the drawings which I made and which sketches showed the features pertaining to the dovetail on the cutters and body for

(Testimony of Frederick W. Jones.)

the reason that I did not think there were any patentable features about it at that time. The same principle had been applied to other reamers to some extent previous to that. Namely the Swan and the Canadian reamers cover pretty near the same features.

The first Canadian reamer I ever saw was to-day in this court room. My knowledge in 1901 was from the catalogue. I think I knew how that reamer was built by observing the catalogue. Furthermore, I had talked to people that had used those reamers previous to that time.

XQ. 371. Now, after you had received this notice from me in the fall of 1902, to stop manufacturing, what you have here to-day said was the reamer like this wooden model, Defendant's Exhibit Wooden Model of Jones underreamer, and you and Skinner had stopped the manufacture of that, did you commence the manufacture of another type of reamer?

[752] A. Yes.

XQ. 372. What was that?

A. One laying on the floor there.

XQ. 373. Please identify that one for us.

A. That is it right there.

XQ. 374. That is the model that is marked Defendant's Exhibit Fred Jones Reamer, Type 1, at the present time, is it? It should be 2, I think. It is now marked 1.

A. At least it was the second reamer that I got up.

XQ. 375. And you commenced the making of that for the first time after you had received this notice

(Testimony of Frederick W. Jones.)

from me, in 1902, did you?

A. I commenced making that after we abandoned the other one.

XQ. 376. Well, now, answer the other question. Did you first commence the manufacture of this second one after you received the notice from me to quit manufacturing the infringing reamer?

A. I don't remember.

XQ. 377. What is your recollection in that regard at the present time? A. I have already stated.

XQ. 378. When did you first manufacture the reamer like the one to which we have last referred here, the one with the removable bowl?

A. I have already stated to the best of my knowledge.

XQ. 379. When was that?

A. After we manufactured the other one.

XQ. 380. So that in 1902 you made the first one like this with the removable bowl? A. Yes.

XQ. 381. What time in 1902? [753]

A. I don't remember the exact date.

XQ. 382. Was it in the fall of 1902?

A. I couldn't say from my—

XQ. 383. Was it as late as the 1st of December, 1902, that you made the first reamer like this reamer, old type?

A. I think it was in the summer or spring of 1902. I am not positive, though, I couldn't swear to that.

XQ. 384. Were you still in business with Mr. Skinner at that time? A. No, thank God!

XQ. 385. And you made none of these reamers

(Testimony of Frederick W. Jones.)

like this with the removable bowl when you were in business with Mr. Skinner as the Santa Paula Tool Works; is that correct?

A. We made the reamers there.

XQ. 386. Well, what kind of reamers did you make there when you were with Skinner?

A. We made both of those kinds.

XQ. 387. And when did you commence making this last kind with the removable bowl?

A. I have already told you I didn't know the exact date.

XQ. 388. You have already told me that you didn't make any while you were with Skinner, thank God. Now, please explain what you want us to understand by your testimony.

A. You asked if I was now engaged with Mr. Skinner. That is the question you asked me. I said no, I am not.

XQ. 389. Now, how long was it after you left the Union Tool Company before you commenced the manufacture of this type of reamer with the removable bowl? A. I don't remember.

XQ. 390. Do you remember whether you made any of those in 1901, in the fall of 1901?

A. I don't think we did. [754]

XQ. 391. Will you state positively that you did or did not, now?

A. No, I would not, because I can't remember the exact dates. I have nothing to refer to to establish the date.

XQ. 392. You were a witness on behalf of Edward

(Testimony of Frederick W. Jones.)

E. Mills in August, 1903, at the office of Hazard & Harpham, in Los Angeles, which office stood on this same spot on which this courtroom now stands, were you? A. Yes, I was a witness on that case.

I was a witness on behalf of Edward Mills in August, 1903. That case involved the application of Edward Double for patent #796,197, and application of Edward Mills for patent, on what was then known as the National underreamer, I believe. I presume I knew at that time Double had an application for patent pending on that reamer. I was a witness on behalf of Mr. Mills. I did not know that the issue was as to whether a patent should be issued to Mr. Double or to Mr. Mills.

XQ. 397. (By Mr. LYON.) You were asked in that case the following question: "Did you ever see the underreamer on which Mr. Double applied for a patent in this case?" And did you answer: "I don't know anything about his applying for a patent, but I saw the reamer," is that not correct?

A. I guess it is.

XQ. 398. You were then asked, "What reamer have you reference to?" And you answered, "I have reference to the first reamer that Mr. Double made, being Double's Exhibit underreamer," did you?

Mr. BLAKESLEE.—Show him the testimony.

The WITNESS.—It is there, isn't it?

Mr. LYON.—Yes.

The WITNESS.—What is the use of asking me such a question? [755]

(Testimony of Frederick W. Jones.)

Mr. LYON.—I want to know if that is a correct record of the testimony given by you at that time?

A. I think it is.

XQ. 399. And the old original reamer, like this patent No. 796,197, was there in evidence and before you at that time, wasn't it? A. Yes.

XQ. 400. You were also asked this question, "State whether from your knowledge of the underreamer put up by Mr. Double and referred to as his exhibit Double's underreamer, was it a practical tool, and whether the same could be successfully used." And you made answer, "To my knowledge it could not." Is that correct? A. Yes.

XQ. 401. You were also asked, "State your knowledge in that regard." "A. My information is from the men that did use it." Is that correct?

A. Yes.

XQ. 402. You were also asked this question and gave the following answer, "Q. Did you have a conversation with Mr. Double in regard to this reamer, and if so state the conversation." "A. While I was employed by Mr. Double, at the same time he was manufacturing this reamer in question, I had a conversation with him, and he said the reamer was a mean thing to manufacture, and that he would change the construction of it, and he showed me what changes he proposed to make, and he also asked me what I thought of the changes, and I told him that I thought the change was a good one; that's all." Is that a true record of the testimony given on that day?

(Testimony of Frederick W. Jones.)

A. No, it is not correct, in this way. It says when the thing was in manufacture, and this took place before it was manufactured. [756]

Q. 403. Did you give the testimony that I have just read in that interference, and on August 10, 1903?

A. I don't remember. I know that that was not the case, because the conversation that you have reference to took place before we commenced to manufacture.

XQ. 404. Please look at the record, and answer the question, did you give that answer on August 10, 1903, to which I have called your attention—yes or no? A. I did.

Mr. BLAKESLEE.—Make such explanation as you wish in connection with that.

Mr. LYON.—You may make any explanation you want. I am only showing now.

The COURT.—He can make any explanation now, or you can bring it out on redirect, if you have any explanation to make.

The WITNESS.—This conversation that he has reference to takes place before we commenced the manufacture of the underreamer of this type.

XQ. 405. The one that was referred to in this case? A. Yes.

XQ. 406. That I read from the record? A. Yes.

I think it was June or July that I left employ of the Union Oil Tool Company in 1901. Think it was

(Testimony of Frederick W. Jones.)

in July; I don't remember what time in the month, I couldn't say.

XQ. 411. And how long before you left there was this conversation to which I have just called your attention from this record of the interference testimony, how long before your leaving?

A. How long before I left?

XQ. 412. Yes.

A. I don't know. I don't remember these dates.
[757]

XQ. 413. Well now, calling your attention to question 11, in your answers in that deposition, "Where was this conversation," you answered, did you, as follows: "At Santa Paula, in his office. I think it was along about the last of June or the first of July, I couldn't state the date exactly, 1901." You gave that answer, did you, at that time? A. Yes.

XQ. 414. And then you were asked this question, "What occasioned him to make the remarks about changing the lever," and you answered, "As he was having a great deal of trouble in manufacturing this reamer in question, that's all"; you gave that answer? A. Yes.

XQ. 415. At that time you refused to answer as to whether you had received notice to discontinue the manufacture of the underreamers which you had been manufacturing in Santa Paula, did you?

A. I don't remember that.

XQ. 416. You were asked this question on cross-examination, "You were notified by Mr. Double, or his company, that the underreamer which you had

(Testimony of Frederick W. Jones.)

been manufacturing prior to October, 1902, was an infringement upon the Brown patent, No. 687,296, dated November 26, 1901, and upon the Double inventions and the patents that would issue thereon, were you not," and you gave the answer, "I was not," is that a correct statement of the question asked and answered, given by you on August 10, 1903?

A. Yes. Those letters were not addressed to me. It was addressed to the company.

XQ. 417. And you did not see them. How long prior to the time Mr. Double had this conversation with you, when he said that this first double reamer was a mean thing to manufacture and then he would change the construction of it, and showed you [758] what changes he proposed to make in it, as you have testified here, in this interference proceeding—how long before that conversation was it that Mr. Gilson brought this Brown model up to Santa Paula, up to the office, to the Union Oil Tool Company?

A. I don't remember the dates, but I know the reamer was there at that time.

XQ. 418. Well, was it the year before?

A. Well, to the best of my knowledge it was some time in 1901.

XQ. 419. Did you ever go down to see Mr. Gilson, or Mr. Eichenhauser, or Mr. George Chatterton in Los Angeles, and talk with them regarding the Brown invention or patent? A. Yes.

XQ. 420. And in regard to the alleged infringement by Mr. Double, and the Union Oil Tool Company on that?

(Testimony of Frederick W. Jones.)

Mr. BLAKESLEE.—We object, no time and place, no foundation laid for such a question.

The COURT.—That matter will come up when he offers impeaching testimony, later. This is preliminary. Objection overruled.

The WITNESS.—I do not ever remember talking to anyone but Mr. Gilson about it.

XQ. 421. What did you have to say to Mr. Gilson?

A. I don't remember just the conversation now.

XQ. 422. When was that?

A. I don't remember the date.

XQ. 423. What year?

A. I think it was in 1901.

XQ. 424. That was after this first Double reamer had been built, wasn't it?

Mr. BLAKESLEE.—Objected to as no foundation. There have been a number of reamers referred to as Double reamers, [759] and it does not fix the time.

The COURT.—Overruled.

The WITNESS.—I don't remember.

XQ. 425. (By Mr. LYON.) Have you no recollection of the circumstances, whatever, of the building of this first Double reamer, like patent 796,197, the one which you are here to-day claiming you invented?

A. I remember this Mr. Gilson came to Santa Paula, and he and I had a conversation there about it, that Mr. Double was taking out a patent in his own name, on a certain reamer.

XQ. 426. Wasn't that the first conversation that

(Testimony of Frederick W. Jones.)

you ever had with Gilson in regard to that matter, had in Los Angeles?

A. The first conversation I had with Mr. Gilson?

XQ. 427. Mr. Gilson.

A. Gilson, I think, at Santa Paula.

XQ. 428. It did? A. Yes.

XQ. 429. Well, was that before or after the first Double reamer the one covered by this patent No. 796,197, was commenced in that shop?

A. I think it was afterwards, yes, it was afterwards.

XQ. 430. The gentleman who has just arisen is Mr. George L. Chatterton, one of the complainants in this case. You are acquainted with him, are you, Mr. Jones? A. Yes.

XQ. 431. When did you first meet him?

A. About three or four months ago, I think it was.

XQ. 432. Never met him in 1901 or '02?

A. Not to my knowledge.

XQ. 433. Did you go down to see old Frederick Eichenhauser in 1901 or 1902, regarding the patent in an attempt by you to make him believe that the Union Oil Tool Company or Mr. [760] Double was infringing on any right of Eichenhauser, Chatterton or Gilson in the Brown patent?

A. I had conversation with Mr. Gilson about that but not with Mr. Chatterton or anyone else, to my knowledge.

XQ. 434. Did you go down to the St. Elmo hotel in Los Angeles, to see Mr. Gilson on that trip?

A. I may have seen him there. I don't know that

(Testimony of Frederick W. Jones.)

I made a special trip for that purpose, or not.

XQ. 435. Did you see Mr. Eichenhauser in connection with Mr. Gilson at that time?

A. No, sir.

XQ. 436. Now, that was after you had left the employ of the Union Oil Tool Company?

A. Yes, sir.

XQ. 437. Please tell us your version, your reasons for making that trip to see Mr. Gilson, Mr. Chatterton and Mr. Eichenhauser in regard to that Brown patent at that time.

Mr. BLAKESLEE.—Objected to as irrelevant and immaterial.

The COURT.—Overruled.

A. I did not make the trip for that purpose.

Mr. BLAKESLEE.—Furthermore as incorrectly quoting the testimony, presuming contrary to the record as to the effect that he went to see all of those parties.

The COURT.—The question was not justified in that particular.

XQ. 438. (Mr. LYON.) What was your reason for seeing Mr. Gilson, as you now limit it to, at that time?

A. Mr. Gilson and me were pretty good friends, and we always talked more or less underreamers when we met up, and I don't remember that I ever made a special trip down to Los Angeles to see Mr. Gilson, or Mr. Gilson ever made a special trip to see me on the question, but when we met up, we always [761] talked about such things, more or less.

(Testimony of Frederick W. Jones.)

At that conversation I do not remember anything mentioned about infringing on anybody. I may have told Gilson to go to Santa Paula and see about it. But I don't remember. The model which Gilson brought to Santa Paula, I think was a 7 $\frac{5}{8}$ " model. I think it was about two feet long. There was no reamer made right after that model was received, that is while I was there.

XQ. 445. Now, I am coming down to last summer; you stated here to-day, that I offered you \$250 not to testify in the other case, the A-4. Where was it that offer was made?

A. On the porch at my home.

XQ. 446. Who was present?

A. My wife and my son and Mr. Youngken and myself.

XQ. 447. Had you seen anyone in reference to the underreamer, at any time within the three months prior to that day, and talked with him? A. Yes.

XQ. 448. Who?

A. Mr. Wilson came to my place to inquire if I knew anything about these reamers.

XQ. 449. That is Elihu C. Wilson who is here present in the courtroom and who is the complainant in the suit in which you testified in Bakersfield, and the president of the defendant corporation, Wilson & Willard Manufacturing Company? A. Yes.

XQ. 450. Now, who else, if anyone, have you talked with prior to your talk with me?

Mr. BLAKESLEE.—Objected to as indefinite, does not say about what or whether connected with

(Testimony of Frederick W. Jones.)

matters in this litigation, not proper cross-examination, either.

The COURT.—Overruled. [762]

A. On the day of the testimony I met Mr.—

XQ. 451. No, before that, Mr. Jones, I am referring to the time before I arrived at McFarland to see you, and within the six weeks prior.

A. No one, to my knowledge, except Mr. Wilson.

XQ. 452. Hadn't Mr. Youngken been there to see you, the day before, Mr. B. N. Youngken—stand up, Mr. Youngken.

(A gentleman stands up.)

A. Yes, I think he had.

XQ. 453. Don't you know that he had?

A. Yes, I think it was—I had got that time mixed up.

XQ. 454. Like some other things you have mixed. You had refused to come down to Los Angeles to testify the day before—

Mr. BLAKESLEE.—We object to remarks to the witness.

The COURT.—The remarks will be stricken out. You are just asked a question.

XQ. 455. (Mr. LYON.) You had refused the day before to come down to Los Angeles to testify in that case, A-4, unless you were paid \$1,000, had you not so stated to Mr. Youngken?

A. No, sir; I had never been requested to come I made the statement to him I would not go and take any part in it for less than a thousand dollars. That was the statement I made to Mr. Youngken.

(Testimony of Frederick W. Jones.)

XQ. 456. That was the day before I came up there?

A. Now, I don't remember what day it was, but I and Mr. Youngken had been there several times and I have forgot whether he had been there before you had or not, but he was there with you the day he was there.

XQ. 457. Now, Mr. Jones, please tell us just what it was, again, that I said to you with regard to offering you any money of any kind on that day.

A. I have already stated the conversation. [763].

XQ. 458. Please restate it in full.

A. I told you that I did not want to have anything at all to do with it, that I was out of the business, and that I did not want to testify in this case, if you would pay me two thousand dollars I would stay out of it; and you said you couldn't do that, you would give me \$250, and I told you I wouldn't consider it.

XQ. 459. You have stated all of that conversation?

A. Well, all of the conversation in regard to the money. I think that was all that there was to it.

XQ. 460. That is your best recollection?

A. Yes, I remember that you said you considered I didn't have anything to sell. That was one point I had forgotten about.

XQ. 461. And didn't I tell you I was familiar with the facts and knew that you had nothing, no rights that were worth anything to either of the parties?

A. Yes, that is it.

XQ. 462. And that I wouldn't give you any money for anything, but that if you would come down to Los Angeles and spend a week or ten days with me, hunt-

(Testimony of Frederick W. Jones.)

ing up all of the old evidence with regard to your old reamers, so that I could prove how many like the removable bowl type, as referred to you had made, and sold, in 1902 and '3 and to whom, that in that case I would pay you not to exceed \$250 for your time, and the time of your wife in coming down and making the search and in compensating you for putting a man in charge of your ranch while you were down here. Isn't that it?

A. I don't remember that.

XQ. 463. None of it?

A. If there was any conversation of that kind took place, I don't remember it. [764]

I am the Fred W. Jones named in the letters patent #809,570. In 1904 I was manufacturing underreamers in Santa Paula substantially in accordance with drawings in that patent. During that time I received notice that I was infringing a certain patent of Edward North. After receiving that notice I came to Los Angeles. I sold all my right covered by patent #809,570 to Mr. Double and Mr. North for one hundred and fifty dollars. I made no claim at that time to either Mr. Double or Mr. North or to Mr. Lyon that I was the inventor of any of the prior Double underreamers.

Cross-examination Resumed.

(By Mr. LYON.)

XQ. 471. We understand from your testimony of yesterday that you testified that when I called upon you at your ranch near McFarland, California, in the

(Testimony of Frederick W. Jones.)

latter part of July, 1915, I offered you \$250 if you would not testify in regard to the underreamer matters on behalf of either party.

A. I made a proposition to you that I would not take up the matter at all on either side, would not testify against it at all if you paid me \$2,000.

XQ. 472. Well, now, what was my statement you said that I made?

A. You said you could not do that, that you would give me \$250.

XQ. 473. For what? What was the rest of the statement?

A. You made that statement yourself. I did not make it.

XQ. 474. \$250 for what? Is that all the statement that was made?

A. That is all my recollection.

XQ. 475. Didn't I state to you that if you would come to Los Angeles, bring your wife down here, go to Santa Paula, dig up all the old records, find the parties that you alleged you [765] had sold the removable bowl reamer to, give me your testimony, and your time hunting that up, I would pay you not to exceed \$250, your expenses and your time, and your expenses in putting a man in charge of your dairy ranch while you were away?

Mr. BLAKESLEE.—We object to that. It is almost a verbatim repetition of the question put yesterday.

The COURT.—It is repetition, but this is cross-

(Testimony of Frederick W. Jones.)

examination. The witness is apparently interested.

Objection overruled. A. No, sir.

XQ. 476. Then you mean to state that my statement was I would give you \$250 practically if you kept still about these underreamer matters; is that it?

A. That is my understanding.

XQ. 477. Well, didn't I tell you in that conversation that it was not necessary for anybody to pay any money to get your testimony, that you could be subpoenaed, compelled to give it?

A. I don't remember.

XQ. 478. Well, you state positively that was no part of the conversation?

A. As far as my knowledge, it was not.

XQ. 479. Now, you did testify in that suit No. A-4 in equity and gave your deposition at Bakersfield, did you?

Mr. BLAKESLEE.—Objected to as having been answered fully.

The COURT.—Objection sustained.

XQ. 480. (By Mr. LYON.) How did you come to come to Bakersfield to give your said deposition?

A. I was subpoenaed there.

XQ. 481. By whom?

A. By the Union Tool Company. [766]

XQ. 482. And you received a telegram from Mr. E. C. Wilson asking you to meet him before you went on the stand to give that deposition, didn't you?

A. He telegraphed me to meet him in Bakersfield at seven o'clock.

XQ. 483. Now, all that was paid you in connection

(Testimony of Frederick W. Jones.)

with your deposition in that case A-4 in equity was your mileage and witness fees at three dollars a day; is that correct?

Mr. BLAKESLEE.—Objected to as having been answered fully.

The COURT.—Objection overruled.

A. That is correct.

XQ. 484. How long, Mr. Jones, after you left the employ of the Union Oil Tool Company was it before you commenced the manufacture of Jones reamers like Defendant's Exhibit Wooden Model of Jones Underreamer, and which for purposes of clarity hereafter I will call the Jones' round nose reamer?

A. I don't know, exactly—don't exactly remember the date. My memory is not good on dates, only certain occasions, things that impress my mind at the time, I remember, but dates, I can't remember.

XQ. 485. Well, was it in the fall of 1901, or the spring of 1902 that you first made Jones round nose reamers? A. I couldn't say.

XQ. 486. Were you engaged in partnership at that time with George L. Skinner? A. Yes, sir.

XQ. 487. At Santa Paula Tool Works?

A. Yes, sir.

XQ. 488. Now, you put out one of the so-called round nose reamers, did you?

A. We put out several. [767]

XQ. 489. And then those not being satisfactory, you devised this second type of Jones reamer, the one which has the removable bowl; is that correct?

Mr. BLAKESLEE.—Objected to as assuming a

(Testimony of Frederick W. Jones.)

fact not testified by the witness as to any unsatisfactoriness, and misleading, putting an improper construction upon previous testimony.

The COURT.—Objection overruled.

A. We manufactured that reamer that you have referred to there.

The COURT.—Which one.

A. The one with the removable bowl.

XQ. 490. (By Mr. LYON.) And you manufactured a number of those, of the removable bowls?

A. Yes.

XQ. 491. And abandoned entirely the manufacture of the Jones round nose type? A. Yes.

XQ. 492. Now, referring to the time you were employed by the Union Oil Tool Company at Santa Paula, during the year 1901, what time during the year was it you left the employ of that company?

A. To the best of my knowledge it was in July.

XQ. 493. What time in July?

A. That, I couldn't state.

XQ. 494. And where had you been working for that company just prior to leaving its employ?

A. I had been working in the machine-shop.

XQ. 495. Which machine-shop?

A. There was only one at that time.

XQ. 496. The Union Oil Tool Company only had one shop at Santa Paula? A. Yes. [768]

XQ. 497. They never operated but the one shop there then at that time? A. Yes.

XQ. 498. You are sure of that?

A. That is all I knew of.

(Testimony of Frederick W. Jones.)

XQ. 499. Isn't it a fact that in 1901 the Union Oil Tool Company had its own shop in Santa Paula and that it also rented Skinner's shop for a portion of the year 1901?

A. I believe it rented a machine there and put a man in there for a time, but that wasn't owning the shop, by any means.

XQ. 500. They were operating in that shop, though, weren't they?

A. I believe they had a man working there for a few days on account of rush of work.

XQ. 501. You were that man, weren't you?

A. No.

XQ. 502. Never worked in the Skinner shop for the Union Oil Tool Company.

A. Not to my knowledge.

XQ. 503. You state positively during June and July, 1901, you were not at work for the Union Oil Tool Company at this Skinner shop, in Santa Paula, and not in the main shop of the Union Oil Tool Company?

A. I said to the best of my knowledge I was not.

XQ. 504. After you, as you supposed using that term in the same sense that you did in your testimony, made this drawing of this underreamer in the shop of the Union Tool Company, and by that I mean this drawing like Double Patent No. 796,197, who is the first one of the workmen in that shop to whom you gave directions in regard to the making of such tool?

Mr. BLAKESLEE.—Objected to as not proper

(Testimony of Frederick W. Jones.)

cross-examination, [769] the witness never having testified he worked in the Union Tool Company shop.

Mr. LYON.—Make it Union Oil Tool Company, then. I left out the “oil.”

The COURT.—Overruled. Proceed.

A. Such things as that was generally done by Mr. Double.

XQ. 505. (By Mr. LYON.) And you gave no instructions to anyone in regard to the work that was to be done in that regard?

A. Only on certain occasions when—

XQ. 506. I am speaking about this particular reamer, not on general work now. A. I can't say.

XQ. 507. Did you ever give any instructions to Mr. W. F. Dinger, in regard to making that particular reamer?

A. I don't remember that I did.

XQ. 508. Or to Mr. Terriberry?

A. I don't remember whether Mr. Terriberry was employed there at that time or not.

XQ. 509. Was he employed there at that time?

A. I couldn't say.

XQ. 510. Did he work on this particular reamer?

A. I don't remember.

XQ. 511. Did Mr. Dinger work on this particular reamer?

A. I don't remember now whether he did or not. He may have done so.

XQ. 512. You know Mr. Weakly? A. Yes.

(Testimony of Frederick W. Jones.)

XQ. 513. What was his job there in the Union Oil Tool shop at that time.

A. He was running a lathe, I believe.

XQ. 514. Did he do any of the work on this reamer? A. I believe he did. [770]

XQ. 515. Did you know T. N. Gibson?

A. I have a slight recollection of him.

XQ. 516. Did he work on this reamer?

A. I don't know.

XQ. 517. What part of the work did he do on it?

A. I don't know that he done any on it.

XQ. 518. Now, I suppose you assembled this reamer, did you, when it was made?

A. I don't remember that I did.

XQ. 519. Well, did you? A. I couldn't say.

XQ. 520. Do you know who did assemble it?

A. I don't remember that.

XQ. 521. Can you tell me any particular work that you did on that reamer?

A. Well, it is 14 years, is a long time for a person to remember what he done and give the exact details, and my memory is not as good as it might be, and I have forgotten a great portion of what transpired in the shop at that time, but as I said before, the things that impressed me most were certain things that transpired, and those were on my mind, and others are apparently a blank at the present time.

XQ. 522. Did you ever talk to Mr. Terriberry in regard to that reamer and in regard to your having taken any part in its invention?

A. Well, I may have; I couldn't say that I did or did not.

(Testimony of Frederick W. Jones.)

XQ. 523. Well, if he was there working at that time and if you had been the inventor of it, you would have, wouldn't you? A. I expect, yes.

XQ. 524. Did you ever talk to Mr. Dinger in regard to [771] that reamer and your having invented it? A. I don't know that I did.

Prior to Mr. Lyon's visit to my place, Mr. E. C. Wilson had been up to see me at the ranch. Mr. Wilson asked me if I knew anything about the under-reamer business, and wanted me to state what I knew to be a fact, and I did so. Then he asked me if I knew what inventors' rights were regarding to inventions, and I told him that I knew something about the law, but I was not very well posted on it, and he *informed that* the inventor and not the man that had taken out the patent was entitled to it, or words to that effect. Those were the principal features of the conversation. There may have been more, but I don't remember.

XQ. 522. Referring now to your deposition in case No. A-4 in Equity, in this court, you were asked by Mr. Blakeslee, the counsel for Elihu C. Wilson, and present counsel for the defendant in this case, the following question, and gave the following answer, is that not correct: "Has Mr. Edward Double or anyone representing him ever paid you or offered you any money or other consideration of any kind further than what you received in compensation for your service in the shop, I mean as a workman in the shop at Santa Paula? A. No, sir. You had better change that because that is going to get balled up

(Testimony of Frederick W. Jones.)

in this other reamer. I might state the amount I got for the Jones patent to which you have called my attention was \$150. Q. The only other money you received was \$150 or thereabouts altogether for assigning to Mr. Double and Mr. North Jones patent 809,570? A. Yes.

That is a correct statement of your testimony given?

MR. BLAKESLEE.—Let the witness be given a chance to examine it. [772]

XQ. 533. Given in Bakersfield?

The COURT.—Speak louder.

A. I think it is.

XQ. 534. (By Mr. LYON.) Referring to your same deposition I call your attention now to cross-question 294, and the answer: "You had a talk with Mr. Frederick S. Lyon, present here, attorney for the defendant in this case, prior to giving your present testimony, did you not? A. Yes. XQ. 295. What did you discuss with him? A. Well, he stated the facts of the case; that there was a—I suppose you would call it a suit, would you not?—between Mr. Wilson and the Union Oil Tool Company, and that he knew from past experience that I knowed a great deal about the underreamer business and its origination here in California, and he came to me for some information which he had positive proof that I could furnish. He knew that I had invented some underreamers and he wanted for me to kind of state as to the dates when these different makes of underreamers were manufactured, and also when they were in-

(Testimony of Frederick W. Jones.)

vented. I think that was about the sum and substance of the conversation as to the underreamer business. Wasn't that about all, Mr. Lyon? * * * Mr. LYON.—I cannot answer now. By Mr. BLAKESLEE.—You have not anything further to state? A. No." That was your testimony? A. Yes.

XQ. 535. (By Mr. LYON.) On redirect examination you were asked question "375 (By Mr. LYON.) And in such conversation with me did you not state that you wanted a thousand dollars and your expenses to come to Los Angeles to give that testimony in this case? A. I mentioned the fact that if my interests in the invention of this reamer was worth anything, it ought to have been worth a thousand dollars. That was the conversation that took place in regard to the money matters. Q. And did [773] you not refuse to come to Los Angeles on behalf of defendant in this case unless you were given your expenses and a thousand dollars? A. No, sir.' Was there any conversation to that effect? A. No, sir.

XQ. 536. Is that the testimony you gave?

A. Yes, sir.

XQ. 537. "390. (By Mr. LYON.) As a part of the conversation which you had with me on August 3d, 1915, I stated to you at that time, did I, that you had no rights in any of these underreamer matters that could be purchased by anyone, anyway, and that you had nothing to sell to the Union Tool Company or to Mr. Double? A. Nor have I nothing to sell now. I have first to establish my claim. Q. I made that statement to you, didn't I? A. Yes. Q. 392.

(Testimony of Frederick W. Jones.)

(By Mr. LYON.) And told you that either party, if they wanted your testimony, could subpoena you and you would be compelled to give your testimony, and that you knew that I knew of my own knowledge in regard to the facts of this case? A. Yes." That was your testimony, was it? A. Yes.

Mr. LYON.—That is all. [774]

Redirect Examination.

(Mr. BLAKESLEE.)

RDQ. 538. Now, in your talk with Mr. Lyon, August 3, 1915, concerning the payment by him to you of \$250 did that refer to your giving testimony in the case?

Mr. LYON.—That is objected to as calling for a construction and interpretation.

The COURT.—The objection sustained.

RDQ. 539. (By Mr. BLAKESLEE.) What was your understanding from the statement made by Mr. Lyon that this \$250 he offered you was to be paid you for?

Mr. LYON.—That is objected to as calling for his conclusion on a conversation.

The COURT.—Objection sustained. He may state the substance; if he cannot remember the words then he can state the substance.

RDQ. 540. (By Mr. BLAKESLEE.) What did Mr. Lyon say it was for? Give the substance of such statement, if you can remember it?

A. I suppose he meant—

The COURT.—That is just what I said you could not tell. You can state what you recollect what he

(Testimony of Frederick W. Jones.)

said and leave it to me to determine what he meant.

A. I told him that if he would give me \$2,000 I would not take any part in it, and he said he could not do it,—he would give me \$250. I suppose it was for me not taking no more in it.

RDQ. 541. (By Mr. BLAKESLEE.) At the time you testified for Mr. Edward Mills in the Double-Mills interference, No. 22,593, concerning underreamers, did you have any business connection with Mr. Double or any member of your family have any such business connection?

A. I think I had a couple of boys working for him at that time. I don't know if I was subpoenaed by Mr. Mills or not. [775]

RDQ. 545. In the testimony read to you by counsel for complainant, quoted from the record in this interference, there is a reference in your answer to question 10, to proposals for changing the construction of a reamer, and that that was proposed during the manufacture of that reamer. What have you to say as to such proposals or changes, what was said in connection therewith and what manufacture did you refer to?

Mr. LYON.—That is objected to as calling for the conclusion of the witness and not for a statement of facts.

The COURT.—The objection is overruled.

A. Which reamer have you reference to?

Mr. LYON.—You are referring to the answer to question 10 which I read to the witness?

Mr. BLAKESLEE.—That is it.

(Testimony of Frederick W. Jones.)

The COURT.—That is in the interference?

Mr. LYON.—The interference.

Mr. BLAKESLEE.—The Mills-Double interference; what is the question with regard to that?

The WITNESS.—Referred to the manufacture of the first reamer that was made with the detachable block.

RDQ. 546. How far had that manufacture proceeded at that time?

A. Well, in fact, I don't believe it had started to manufacture; it was under discussion at that time.

RDQ. 547. And what changes were proposed, in other words, what was said as to such proposed changes?

A. Well, we had talked the matter over for several days. I had advanced several ideas and did not know what he was going to accept or reject in the matter, until finally we concluded to adopt the present style of reamer.

RDQ. 548. Well, who was it first made the changes which Mr. Double suggested? [776]

Mr. LYON.—That is objected to as leading and as calling for a conclusion.

The COURT.—It is is leading.

RDQ. 549. (By Mr. BLAKESLEE.) Well, you stated you talked over certain things with Mr. Double. In such talks who was it suggested the changes and what was said in that connection?

A. Well, the changes was principally suggested by me, and I was the one he conversed with about these things more than anyone in the shop.

(Testimony of Frederick W. Jones.)

I called on Mr. Mills this morning at the Mills Iron Works and he stated that he had never seen the 6" wooden model of the first round nose reamer. The sketches I made in 1901 were left at the office of the Oil Well Tool Company. Those sketches laid around the office of the Oil Tool Company for several months. I think they were there when I left that shop.

In regard to the notice of infringement I received from Mr. Double, will say that I don't think there were any numbers of any patents given in that notice.

RDQ. 550. You have stated that you abandoned the manufacture of the round nose type of reamer prior to taking up the manufacture of the removable bowl type reamer. Was there any reason other than the receipt by you of that notice of threat of infringement leading you to abandon such round nose type reamer manufacture?

A. Yes. They did not prove to be a perfect success, although they were used. But they gave more or less trouble in getting them down the casing and so I invented the other reamer on account of it being a better reamer and done away with the difficulty of getting it through the casing.

Not until Mr. Wilson informed me in regard to what the rights of a patentee or an inventor are even though he be employed [777] by another at the time of making the invention had I known of such.

RDQ. 563. (By Mr. LYON.) Had you made any claim of any kind prior to 1915 or any assertion of

(Testimony of Frederick W. Jones.)

it, either to the Union Oil Tool Company or Union Tool Company or Edward Double or any person connected therewith that you had anything to do with the invention of the Double reamer. A. No.

Mr. BLAKESLEE.—Objected to as the witness has already testified that he did not believe there was any invention.

The COURT.—Overruled. Is that all?

Mr. LYON.—Just a moment.

RDQ. 564. I show you a document and ask you if that is a drawing of the application for patent filed by you on the Jones round nose removable bowl reamer so-called? A. Yes, that is it.

Mr. LYON.—We offer this in evidence in connection with the cross-examination of this witness.

The COURT.—It will be admitted.

RDQ. 565. (By Mr. LYON.) You never filed any application for patent upon the Jones round nose reamer, did you? A. No, sir.

Mr. BLAKESLEE.—Objected to as calling for a conclusion.

The COURT.—Overruled.

Mr. LYON.—That is all. Witness excused.

**Testimony of William G. Naugle, Witness Called
on Behalf of Defendant.**

Mr. Naugle testified as follows: My name is W. G. Naugle, age 43, residence, Santa Paula, hardware merchant. In 1901 I was employed by the Union Oil Tool Company in Santa Paula. Was working as a boilermaker's helper. Was acquainted with Frederick W. Jones. Mr. Jones was

(Testimony of William G. Naugle.)

a machinist in the Union Oil Tool Company's shop at the time I was employed there. He did general work on the oil well tools. I know he worked on the Double underreamer. It was a new underreamer. [778]

Q. 18. And was that an underreamer that they were manufacturing right along in that shop?

Mr. LYON.—That is objected to as leading.

The COURT.—Objection overruled.

A. To my memory it was a new underreamer. I wasn't at all familiar with what was being manufactured; I was a new man there, but it is just very faint in my memory as I remember, Mr. Jones was working on an underreamer.

What I remember about it was this: The machine-shop was in front of the shop, the boiler-shop was in the next lot, and the Union well supply house was in the next lot. We had to pass through the boiler-room to get to the supply house where we would get different materials for to put in, different tools for machines that they would be working on. And I remember the underreamer hanging in the shop and Jones was working on it and went back and forth through the shop to get different things for it. I do not know what year it was. I cannot describe that reamer now.

Q. 25. Do you remember any other underreamer that Mr. Jones was working upon during that period of time—during the years 1900 and 1901?

The COURT.—He has not testified anything about 1900.

(Testimony of William G. Naugle.)

Mr. BLAKESLEE.—He said it was during 1900 or 1901, the period of time that they both were employed there.

The COURT.—I understood he testified he went to work there in 1901.

Mr. LYON.—He said he couldn't state whether it was 1900 or 1901 when he was there.

A. I remember that they were first working on an underreamer, and they took it out to the oil field, and if my memory is right it lost the jaws of it off, or something like that, and it was brought back and they changed the pattern or style of the reamer.

Q. 26. (By Mr. BLAKESLEE.) Have you any knowledge of any such [779] changes—what they were?

A. No; I don't know anything of the changes.

Mr. LYON.—We move to strike the preceding answer from the record on the ground that it is hearsay.

The COURT.—Well, it does not appear to be hearsay now. Denied.

I am acquainted with John A. Richardson of Santa Paula. He was in that shop at the same time. I am also acquainted with Richard D. Whidden of Santa Paula. He was connected with the Union Oil Tool Company at that time. I saw Mr. Whidden almost every day when I was working at that shop. His office was right adjoining. The boiler-shop was under the same roof of the Union Oil Tool Company's shop only a partition between them. I do not know that the same reamer was

(Testimony of William G. Naugle.)

changed after the jaws were broken in it but there was a change from that reamer to one having dovetails in it. I wont say that it was the same reamer. From what I know about forgings, I would not think the same reamer could be changed. It is my recollection that Mr. Jones was still employed by the Union Oil Tool Company when this reamer was brought back with the jaws lost. I don't remember what time of year it was when that reamer was brought back with the jaws lost. I don't know whether it was 1900, 1901 or 1902. I was connected with the Union Oil Tool Company until they moved to Los Angeles.

RDQ. 52. (By Mr. BLAKESLEE.) Have you any recollection as to who worked on the reamer in the changed or modified form or the reamer of modified form, including the dovetails, after the trial of the first reamer that Jones worked on?

A. According to my recollection it was at the time Jones worked on it. While I may be wrong, it is in my mind that he worked on this second reamer and, as I remember his general talk was—

Mr. LYON.—Wait a moment. We object to the general talk as hearsay. [780]

The COURT.—Sustained.

RDQ. 53. (By Mr. BLAKESLEE.) Is that your best recollection?

A. That is my recollection,—that Jones worked on the reamer when it came back.

Mr. BLAKESLEE.—That is all.

Testimony of Mrs. Olive E. Jones, for Defendant.

My name is Olive E. Jones; residence, McFarland; housewife. I am wife of Frederick W. Jones. Have lived in Santa Paula and was then the wife of Frederick W. Jones. Went to Santa Paula in February, 1897. My recollection is Mr. Jones left the Union Oil Tool Company's shop employment in July, 1901. I had a sister visiting me through May, June and July, 1901, and it was during that time that he quit the Union Oil Tool Company. My sister's visit terminated in August. The latter part of Mr. Jones' employment, Mr. William B. Naugle was foreman. Mr. Jones had been foreman prior to my acquaintance with him. I visited that shop many times. I visited all parts of the shop, wherever Mr. Jones happened to be. I went to the office and if he was in the machine shop I went there. I remember at one time he was working or discussing workings on drawings on an underreamer. I believe Mr. Whitten was there and also Mr. Double. Before seeing those drawings I had heard Mr. Jones discuss them. He told me what changes he was going to make. When the first reamer went out it failed to be a success, on account of not being enough stock, as he said, in the cutters, and he was going to change and make dovetails in the cutters and also in the body. That discussion I had with him previous to the time I saw him working on the drawings in the office of the Union Oil Tool Company. He talked at home stating that there would have to be a change made in some way to give more

(Testimony of Mrs. Olive E. Jones.)

stock to the cutters, as there was where the under-reamer was weak. As I stated before that was prior to the time I saw him working on the drawings in the office. [781] I saw the drawings at that time in the office. To the best of my recollection he showed me the changes he had made or that were made to give the cutters more stock. The drawings were not completed at that time. I have seen drawings before like that shown in Complainant's Exhibit Double Patent. In describing those drawings I will say that the cutter had a slot in it, and the body had a slot in it, and the cutters had something that just fit up in that slot, and the body had been cut entirely away to give room for more body in these cutters. That is the change he showed me, that he had talked about. The cutters worked up in the body in the place of the outside. The drawings he was working on was like those shown by Complainant's Exhibit Double Reamer Patent. That was the drawing he was working on, and it was this part of the body and this part of the cutters what he was making the change in, and here is where the portion was cut out in the body to let the cutters have more stock.

By Mr. BLAKESLEE.—Let the records show that the witness points first to figure 9 and to the part marked 7 and 9, and the adjacent portion and secondly, to figure 11 and the part on the cutters marked 29.

When Mr. Jones got up that round-nose cutter and also the two reamers that he got up himself

(Testimony of Mrs. Olive E. Jones.)

during 1901 and 2 he showed me the drawings. The wooden model, reamer #1 is like one of those reamers. It was in the fall of 1901 that I saw a drawing like reamer #2. I saw sketches like wooden model or reamer #2 that I have just pointed out. That was in the spring and summer of 1901. I also saw a little wooden model in the early part of 1901 like that type of reamer. It was about an inch or an inch and a half in diameter and about six or eight inches long. He carried it around in his pocket, and took it out at the house many times. I do not remember of seeing any drawings like patent #796,197. I saw the small pocket model of the Jones round nose reamer possibly three maybe four months, before he left the employ of the Union Oil Company. [782] I saw it first prior to the time my sister visited us. I saw Mr. Lyon, he came to our place probably in July or August. That was in 1915, yes. Mr. Youngken, myself, Mr. Jones, our little boy, and Mr. Lyon were all present. Mr. Jones told him that if he would give him two thousand dollars that he would stay out of it and not have anything to do with either side of the question, and Mr. Lyon told him he could not do that, but he would give him two hundred and fifty dollars if he would stay out of it, and Mr. Jones said he would not consider such an offer. Mr. Lyon did not say the company would give it, but he said he would, if he had to, in behalf of the company.

Cross-examination.

XQ. 70. Mrs. Jones, was there anything said in

(Testimony of Mrs. Olive E. Jones.)

that conversation about Mr. Jones and yourself coming down to Los Angeles and looking up the records in regard to these old underreamers?

A. Not that I remember of.

XQ. 71. Nothing whatever? A. No, sir.

XQ. 72. Did I ask Mr. Jones if he would testify or come to Los Angeles to testify in that case?

A. You did, and then Mr. Jones said that he would take \$2000 and stay out of it and not testify on either side.

XQ. 73. And did I not tell Mr. Jones in your presence that I came up there and that I wanted him to come down and testify in that case?

A. No, sir; I don't remember that.

XQ. 74. Had you heard the conversation between your husband and Mr. B. N. Youngken of the day before? A. Part of it.

XQ. 75. Did Mr. Jones tell Mr. Youngken that he would not come down to testify unless he was paid a thousand dollars?

Mr. BLAKESLEE.—Objected to as not cross-examination. [783]

The COURT.—Overruled.

A. I never heard that.

XQ. 76. (By Mr. LYON.) You would not state that? A. Positively.

XQ. 77. You testified in that case at Bakersfield in response to a subpoena, didn't you?

A. Yes; to the best of my knowledge.

XQ. 77. At that time you saw these models and photographs of the models and the two reamers that

(Testimony of Mrs. Olive E. Jones.)

we had in evidence at that time? A. Yes, sir.

XQ. 78. And identified them?

A. I was not asked to identify the reamers and I don't believe that I paid much attention to that. To the best of my knowledge I was not asked to identify them.

XQ. 79. You were not asked anything about when he made the— A. Yes; I saw that.

XQ. 80. And was not your attention called to two underreamers then on the floor?

Mr. BLAKESLEE.—We ask that the witness be confronted with the testimony.

The COURT.—This is preliminary. Overruled.

A. I believe they were.

XQ. 81. (By Mr. LYON.) Now, please step down from the witness stand and come here where these models are where you were looking around and attempting to identify the second Jones reamer. You observe the reamer that I now put my foot on, don't you?

XQ. 82. Isn't that one of the two we had at Bakersfield and to which you refer?

A. That I couldn't tell. [784]

Mr. LYON.—Let it be noted on the record that I placed my foot in asking the question upon Defendant's Exhibit Fred. W. Jones Reamer Type 1 as now marked in A-4 Equity, being the so-called Jones removable bowl reamer.

A. We have a model like that at home.

XQ. 83. (By Mr. LYON.) Now, to further illustrate what happened when you came down here,

(Testimony of Mrs. Olive E. Jones.)

you put your foot on this reamer.

A. That I think is his reamer, but we have a small model of this at home at the present time.

XQ. 84. Since I point it out to you, you now remember it?

A. No, sir; I remember when I came up here. But I remember that nose being his invention—this part here.

Mr. BLAKESLEE.—The witness points to the round-nose and of the reamer marked now “Fred W. Jones Reamer Type 2” in A-4 Equity.

XQ. 85. (By Mr. LYON.) You never saw any drawings like that of the drawing of patent 796,197, did you?

A. Not unless it was at Bakersfield, and I don’t recognize it now.

XQ. 86. You never saw a reamer like that there, did you?

A. If they were at the shop, I did. I don’t remember.

XQ. 87. You never discussed that kind of a reamer with Mr. Jones, did you?

A. Not that I remember of.

Mr. BLAKESLEE.—He is calling for a conclusion. He might have discussed features and not the whole.

The COURT.—Overruled.

XQ. 88. (By Mr. LYON.) What time of the year was it when Mr. Jones, as you say, was working on some drawings and you think Mr. Edward Double and Mr. Whidden were present in the office

(Testimony of Mrs. Olive E. Jones.)

of the Union Oil Tool Company at Santa Paula?
[785]

A. To the best of my knowledge, it was May or June, 1901.

XQ. 89. How long have you been in Los Angeles this trip? A. Since Monday morning.

XQ. 90. And on how many occasions have you been at the office of Mr. Raymond Ives Blakeslee, the attorney for the defendant in this case?

A. How many times?

XQ. 91. Yes.

A. I have been in the receiving room three times, but I have never been in his own private office since I came into town.

XQ. 92. Were you not in that room where all these exhibits were on either Tuesday or Wednesday of this week?

A. No, sir; I have not been in his private office—

XQ. 93. You have seen those exhibits, however, several times, in the last year, haven't you?

A. At Bakersfield I saw them.

XQ. 94. You have talked this matter over—

Mr. BLAKESLEE.—It is indefinite which exhibits are referred to.

Mr. LYON.—We refer to the three that she has identified in her direct and cross-examination. She knows what I mean.

XQ. 95. You have talked this matter over on a good many different occasions since last June with several different people, haven't you?

A. Naturally, it has been discussed more or less.

(Testimony of Mrs. Olive E. Jones.)

XQ. 96. You have heard the discussion between Mr. Jones and Mr. E. C. Wilson and some discussions between Mr. Jones and Mr. Blakeslee and without and with Mr. Wilson present?

A. I have heard some; yes, sir.

XQ. 97. And it has been discussed to a great extent in the last week or ten days, has it? [786]

A. I haven't heard it discussed.

Mr. LYON.—We offer in connection with the examination of this witness the affidavit of the witness made on the motion for leave to take testimony, and I will read it to the witness as follows: “That she is the wife of one Frederick W. Jones and with him now resides at McFarland, County of Kern, State of California; that in the year 1901, she and her said husband resided at Santa Paula, country of Ventura and State of California, where her said husband was then employed as machinist in the shop of the Union Oil Tool Company of which one Edward Double, now president of the Union Tool Company, complainant in the above-entitled action was then foreman; that during said year 1901, her said husband did devise a certain underreamer which was constructed in said shop during said year 1901, and the general construction and combination of the parts and features of which was substantially in accordance with the drawings of United States letters patent No. 796,197, issued to said Edward Double, August 1st, 1905, for underreamers; that affiant saw said underreamer in said shop during its course of construction and likewise was present at said shop

(Testimony of Mrs. Olive E. Jones.)

when her said husband was performing work upon said underreamer; and that at all times her husband has asserted and contended that he and not said Edward Double invented said underreamer, and likewise the underreamer of the letters patent to Double sued under herein."

Mr. LYON.—That is the one that she said she never saw a drawing of or a reamer like it.

Mr. BLAKESLEE.—She did not say she had not seen a reamer like it.

A. I never said I didn't see a reamer like it.

Mr. LYON.—That is all.

Mr. BLAKESLEE.—That is all. [787]

**Testimony of John A. Richardson, Produced as a
Witness on Behalf of Defendant.**

Mr. Richardson testifies as follows:

My name is John A. Richardson, residence Santa Paula; occupation, merchant; age, 75. I am familiar with oil well tools having worked in machine-shops since 1865, in Pennsylvania, Canada and California. Was employed in Petrolia, Canada in 1866. Did a general oil well tool business there. I know of the firm of the Oil Well Supply Company of Canada. I did not work for them. I repaired underreamers in Canada. Did no underreamer work in Pennsylvania. Was employed by the Union Oil Well Tool Company at Santa Paula and did work on underreamers there. I have seen underreamers like that represented in Figure 2161 of the Oil Well Supply Company Catalogue. I saw them in Petrolia, Canada. I saw it first in 1866. The reamer I

(Testimony of John A. Richardson.)

saw may not be just exactly the same as that disclosed in Figure 2161, but it was on the same principle. Of course there may be some improvements in it since I first saw it. I would recognize one of those reamers now if I saw it. Yes, this is one here. Witness puts his foot upon Defendant's Exhibit Oil Well Supply Company Canada 4½" Underreamer.

I commenced work with the Union Oil Tool Company in California in the year of 1900 of May. Arrived in California I think on the 26th day of April, 1900. Went to work for the Union Oil Tool Company about the 1st of May. Remained with them until they moved to Los Angeles. At present am conducting a hardware store in Santa Paula.

Am acquainted with Frederick W. Jones, having known him since my arrival in California. He was a machinist in the Union Oil Tool Company's shop at the time I went there. I worked in the blacksmith-shop as a blacksmith. I worked on underreamers. Worked on the reamers known as the Double underreamer. Did repairs to Austrian underreamers and Swan underreamers. I used to [788] make the cutters, spring and the key for underreamers. The reamer consists of a plunger, spring and a body. The cutters were spring actuated and expanded so as to cut a larger hole in the well. The cutters had a shoulder on the inside to close over the bottom of the body. Probably a dozen or so of those reamers were made while I was in the shop. I worked on all of them. On new work I used to get what we called a "working draft" and

(Testimony of John A. Richardson.)

worked to that. By draft I mean a drawing. I don't know who had to see the drawings—I used to see Mr. Jones making the drawings. He made the drawings in the office—that is in the office of the shop—Mr. Double's. I talked with all the men in the shop about those reamers, namely, Mr. Thomas, Mr. Jones, Mr. Youngken and probably with Mr. Double. Also with Mr. Dinger. I don't remember of receiving any instructions from Mr. Double in regard to that underreamer. Mr. Jones was working on the different parts of the underreamer. I did not see any reamers of that type made in the Union Oil Tool Company's shop prior to the time I saw Mr. Jones making the drawings. I was a sort of a general man in the blacksmith-shop and all the different men would bring different work to do. Mr. Double would generally bring me the new work to do. Double was the boss of the shop.

Q. 105. To the best of your recollection who was it that gave instructions in the shop as to the actual shop work in the running of the shop and executing repair jobs and making such alterations and changes as were found in the reamer work?

Mr. LYON.—We object to that on the ground that it calls for a conclusion and not for a statement of fact.

COURT.—Overruled.

A. Well, I was a kind of a general man in the shop, and all the different men, all the different machinists would bring me a job to do and I would do it. And new work Mr. Double would [789] gen-

(Testimony of John A. Richardson.)

erally bring me the new work, and Dinger, and the machinists all of them would bring jobs for me to do, and I would do it without any instructions from anybody.

I have talked and discussed the underreamer with Mr. Jones. It was the drawings I saw Mr. Jones making in Double's office which I used as a guide in making the parts of the Double underreamer. The first reamer was condemned as not workable. The cutters were left in the hole. For a time I made the cutters and then Mr. Dinger made them.

Q. 121. In making up the first of those reamers and using the drawings which you say Mr. Jones made in the office, please state to what extent, if at all, your work followed those drawings.

A. Well, I got drawings for nothing but the cutters. The mandrel and spring and key did not require drawings.

I did not need drawings to make the mandrel and the spring. I did no work on the reamer body itself. When changes were made in the design I was simply given the size. They did not require drawings.

Jones showed me a model—a pocket model of his reamer—in the shop there. It was about six inches long or four inches long probably. It was like "Defendant's Exhibit Fred W. Jones Reamer No. 2," namely, the round nose Jones' reamer. It was during the summer of 1901 I think he showed me this model. It was while Jones worked in the shop. I criticized it somewhat as I always objected to a reamer of any kind that the cutters were hung on a spring.

(Testimony of John A. Richardson.)

It was not until after Jones left that shop that he made the working size model in accordance with that pocket model. It was while he was in the Skinner shop—probably 1902. The reamer shown in Double's patent No. 796,197 is like the original I saw in the Union Oil Tool Company's shop in 1901. I made the cutters of the [790] original reamer that was like that drawing. Mr. Dinger forged the body. I had made springs and mandrels for reamers before. Not so many of them in that shop, however. I don't know that I saw the particular draft made that was given to me. I saw all the drafts of the body and a blue-print of reamer would be a different thing from the working draft which I had to make my cutters.

Q. 165. Can you state of your own knowledge who made that draft that was brought to you?

A. Well, Mr. Double or Mr. Jones I saw working at it in the office.

I don't remember that I talked with Jones about the Canadian reamer prior to making the reamer over. Probably discussed, what I know of them, in a general way with him. I know Mr. D. Whidden in about 1900—he was working on a pipe-line. He made his headquarters in an office across the road from the shop. I also know Mr. William B. Naugle who worked in the Union Oil Tool Company's shop at that time. I don't know that I ever saw Edward Double making any drawings in that shop. I do not know that he could make drawings. I do not know that he had ever received any instructions in making drawings. I made the forgings of the cut-

(Testimony of John A. Richardson.)

ters of the first underreamer like "Complainant's Exhibit Double Patent." The shoulders I made and to which I refer were the shoulders 18 of the drawing. The part 29 in figure 11 of these drawings was not forged—it was not my part of the work.

Cross-examination.

XQ. 188. (By Mr. LYON.) I show you again Complainant's Exhibit Double Patent 796,197, and ask you to look at the drawings.

You stated here that you had never seen these drawings before to-day. Is that true?

A. I probably seen them before, but I never paid any attention. [791]

XQ. 189. When did you ever see them before?

A. That I couldn't say. I had better answer that I have not seen them.

XQ. 190. Have you ever seen that before, have you not? A. No.

XQ. 191. You are not sure you never saw them before?

A. No; not in that form. I saw the pieces before they were assembled.

XQ. 192. You never saw this patent before to-day?

A. No.

XQ. 193. Did you make an affidavit in this case swearing to the same before a notary public by the name of Crawford, on the 30th of August, 1915?

A. Yes.

XQ. 194. In that affidavit—

A. If he had that draft there I have forgotten it.

XQ. 195. In that affidavit you said that during the

(Testimony of John A. Richardson.)

spring and summer of the year 1901 certain sketches or drawings were made at said shop of features of an underreamer device for enlarging oil well holes, which sketches or drawings show features of underreamer construction displayed in the drawings in United States Patent No. 796,197, issued August 1, 1905, to Edward Double; did you? A. Yes, sir.

XQ. 196. Then you must have had this patent before you at that time for making this affidavit?

Mr. BLAKESLEE.—Objected to as argumentative.

The COURT.—The objection is overruled.

XQ. 197. (By Mr. LYON.) You had a copy of this patent before you when you made that affidavit?

A. I have forgotten if I did. [792]

XQ. 198. You cannot remember now whether you saw those drawings on August 30, 1915?

A. If my affidavit says that I did, why, I did.

The office in which I saw Mr. Jones making those drawings was in the corner of the shop. I don't remember if it was in 1900 or 1901 that I saw Mr. Jones working on those drawings in that office. To the best of my recollection Jones was still in the employ of the Union Oil Tool Company's shop when that first reamer came back without the cutters. I knew Walter Weekly, yes. He was foreman of the machine-shop. I don't know what part of this first reamer he made. Jones was employed as a common machinist at that time. I think Jones worked in Mr. Skinner's shop in 1902 just before he left the employ of the Union Oil Tool Company. I do

(Testimony of John A. Richardson.)

not know what Mr. Jones did after he left the Union Oil Tool Co. shop. I have forgotten whether he then left Santa Paula. He worked in the Skinner shop after he left the employ of the Union Oil Tool Company. Think Jones worked in the Skinner shop maybe a month before he left the employ of the Union Oil Tool Company. Don't know that he put all his time in there. I saw him at that shop.

Testimony of Edward Double, for Complainants.

Testimony of EDWARD DOUBLE, called as witness on part of complainant, testified as follows:

My name is Edward Double; president of the Union Tool Company.

Q. 1. (By Mr. LYON.) You are the Edward Double who is president of the Union Tool Company and who has heretofore testified in this case?

A. Yes.

Q. 2. You have heard the testimony of Mr. Fred W. Jones given in this case? A. Yes, sir.

Q. 3. I show you Complainant's Exhibit Double Patent No 796,197. You are the Edward Double named therein, are you? A. Yes. [793]

Q. 4. Do you know who first conceived the construction of an underreamer as therein set forth and described?

Mr. BLAKESLEE.—Objected to as calling for a conclusion and requiring absolutely a conclusion as to whether the conception was commensurate with what is there. It is not the proper method of proof and not the method of establishing the origination of the patent.

(Testimony of Edward Double.)

The COURT.—The objection is overruled.

A. I did.

Q. 5. State the circumstances under which you conceived that invention, and after its conception what you did therewith.

A. I was employed at Santa Paula as foreman of the Union Oil Tool Company's shop, and conceived the idea on June 8, 1901. I started in to build the reamer. I made all the sketches and all the drawings or so-called drawings there were to manufacture the reamer, and delivered them to the shop and instructed all the men, and the reamer was built absolutely under my instructions from start to finish.

I testified in the interference suit with Edward E. Mills. That was in 1903. At that time we had all time-sheets and complete records of the job for making that first reamer. I do not know where those records are now. I have not made a search for them but they may be found if we made a search of the Tool Company's office. They were produced when I testified in the interference. Jones had nothing whatever to do with giving instructions to anybody in the shop. At the time that this particular reamer like the drawings of patent No. 796,197 were made in the shop of the Union Oil Tool Company at Santa Paula, Jones was working down in George L. Skinner's shop in Santa Paula. He was in the employ of the Union Oil Tool Company.

I first explained the reamer like patent No. 796,197 to Mr. W. F. Dinger and Walter Weekly. They were employees of the Union Oil [794] Tool Com-

(Testimony of Edward Double.)

pany's shop. Dinger was a blacksmith and Weekly was a machinist. I brought them into my office and started them to build the reamer and gave Mr. Dinger instructions to make the forgings and also instructed Mr. Weekly on some of the machine parts on the body of the reamer. Jones did no work on that reamer to the best of my knowledge. That reamer was completed some time in the latter part of July, 1901. Jones left our employ about the 15th of July, 1901. The reamer was sent out in the latter part of July, 1901. At that time Jones was not in our employ nor was he in our employ when that reamer was returned from its first use.

I believe Mr. Richardson made some of the small parts of the reamer shown by patent No. 796,197. He received instructions from myself.

Jones did not show me the small pocket model of an underreamer during the years 1900 or 1901.

I had seen a round-nose underreamer like the Jones' round-nose underreamer before the commencement of this trial during the latter part of 1901 in George L. Skinner's shop. That was the first time I ever saw such a reamer or model of that reamer, or had any information in regard to it. That was in about August, 1901. At no time prior to Jones leaving our employ did I ever hear him say that he had invented any kind of an underreamer. Jones did not assist in any manner in designing or creating the underreamer shown or described in "Complainant's Double Patent No. 796,197." I have seen a reamer like Jones' reamer

(Testimony of Edward Double.)

with the removable bowl, yes. In the last part of 1902 was when I first saw it.

Q. 43. Under what circumstances and where?

A. Mr. Lyon as my attorney in the patent cases called my attention to one of such reamers at the R. H. Herron Supply Company, and we went down there to look it over.

Q. 44. That was in the city of Los Angeles, California? A. Yes. [795]

Q. 45. Had you ever seen any such Jones' reamer prior to that time? A. No.

Q. 46. Had you ever had any conversation with Mr. Fred W. Jones in reference to such underreamer prior to that time? A. No.

There was no such catalogue in the office of the Union Oil Tool Company which disclosed the Canadian underreamer. The first I saw it it was called to my attention the latter part of 1902 in Mr. Lyon's office. Mr. Lyon asked me then if I had ever seen the Canadian reamer. That is the first time I saw Figure 2161 of that catalogue. The blue-print like cut No. 2161 Mr. Lyon obtained at my request. Obtained same from the Oil Well Supply Company of Pittsburg in the latter part of 1902.

Mr. LYON.—We offer in evidence blue-print "Complainant's Exhibit Oil Well Supply Company's blue-print of 1902."

I wished that information in order to ascertain how the reamer worked. I couldn't tell Mr. Lyon how it worked, from the catalog, and wanted to get further information. The writing on it, "not recom-

(Testimony of Edward Double.)

mended for cable tools" was on this blue-print when I received it.

I received no suggestions from Fred W. Jones concerning design of underreamer "Complainant's Exhibit Double Patent No. 796,197" or "Complainant's Exhibit Double Patent," being the patent in suit, No. 734,833.

Skinner's shop where Mr. Jones worked was just across the railroad, about a city block from my shop.

I am able to fix the date of my conception of the invention as June 8, 1901, as that was my testimony in the interference case between Mills and myself. It at that time was very fresh in my mind. I will state under oath that Jones was not present in that [796] office when I conceived the idea of that underreamer on that date.

I had been working on underreamers for some time past and on that particular day I conceived the idea of the underreamer. I made up pencil sketches of an underreamer. I believe I can make sketches of that reamer now.

The COURT.—The Court here takes a recess for five minutes during which time the witness is engaged in making a sketch.

I herewith produce a sketch. I made a number of sketches. I cannot say how many.

Q. 84. Well, were the sketches that pertained to this matter all contained in one view or figure, as we say in drawings, or were they in fragments, scattered over the sheet?

A. Oh, they would naturally be in different views.

(Testimony of Edward Double.)

Mr. BLAKESLEE.—We would ask the answer be stricken out as not responsive, what the custom is.

The COURT.—It will be stricken out. You are asked about just what you did at that time.

The WITNESS.—I don't recall, to the best of my knowledge, just the number of sketches I made on that day.

I know that I made a sketch on that day showing all the parts together like this. The sketch was probably destroyed or misplaced. Have not attempted to look for the sketches since. That is since July or August of 1901. Had made sketches of underreamer prior to June 8, 1901.

Had never made any sketches of underreamers before I met Frederick W. Jones. I did not submit the sketch I made on June 8, 1901, to Mr. Jones. He did not see it that day. I have discussed it with him later. Probably thirty or sixty days after that. I simply showed him what I had devised. Yes, I did discuss it within thirty days.

Q. 99. Why did you show him what you had devised? [797]

A. Well, he was in my employ, and we was building the reamers, and naturally the conversation would drift along those lines.

Q. 110. Nothing was done with those sketches in the meantime then?

A. Nothing was done with those sketches until they were put into the shop and explained to the workmen.

XQ. 111. And in explaining to the workmen,

(Testimony of Edward Double.)

didn't you discuss it with the workmen?

A. Certainly did.

XQ. 112. And that did not occur for 30 to 60 days, is that correct? A. Approximately 30 days; yes.

I conceived the idea of a central spreading bar, with tilting action of the slips, making the key-seat larger than the key was to allow the cutters to partake of the tilting action so as to collapse around a central spreading bar.

I believe that the tilting action was new with me. I had seen the Brown device before that time. It had a different tilting action. The Brown device had a pendulum-like action of the cutters. The Defendant's Exhibit Model Brown Underreamer looks similar to the Brown reamer, yes. The Brown device that I saw previous to making those sketches on June 8, 1901, are constructed substantially in accordance with Defendant's Exhibit Specification U. S. Patent #687,296. Later on my interests in the Union Oil Tool Company made a swap for certain interests in that Brown patent, in exchange for interest in the Double patent.

XQ. 131. The part which I now mark small a on the sketch, namely, inwardly projecting portions from what I mark small b was known to you before the time you made those sketches on June 8th, 1901, were they not? [798]

A. They were.

The COURT.—Part marked small a?

Mr. BLAKESLEE.—Yes.

The COURT.—What did you say about small b?

(Testimony of Edward Double.)

Mr. BLAKESLEE.—Inwardly projecting from the part marked b.

XQ. 132. (By Mr. BLAKESLEE.) And the part which I now mark small c surrounded by the part marked small d, which I take to represent a coil spring, were parts known in oil well practice and known to you before June 8th, 1901, were they not?

A. They were.

XQ. 133. And the part I mark small e and which I take it to be a key connecting the part small c with the parts small d, which I take it represents small cutters, was known by you and known in oil well practice before June 8, 1901, was it not?

A. Not in that particular form of construction,—not in that particular combination.

XQ. 134. My question pertained to the key itself as a part for connecting cutters with a spring actuated rod, key small c, such a key was known for like use, was it not, prior to that date? A. Yes.

Springs, rods and tees, those kind of things were known to me and in oil well practice but not used in combination like I used in mine. The rod with the slot in it for a key and the central part or extension of the body over which the cutters tilt were not known to me before. I was acquainted with the Swan reamer prior to that time. I have seen the so-called Swan patent. In referring to Defendant's Exhibit Swan Patent #683,352, the parts in Figure 3 marked A-3, will say that that form or hollow, slotted extension upon which the cutters ride in the Swan reamer in collapsing and expanding the cut-

(Testimony of Edward Double.)

ters, was known to me before June 8, 1901. [799]

I made a statement about not having seen the Swan patent prior to June 8, 1901. I have seen the reamer but not the patent. The Swan underreamer was well known in the art prior to June 8, 1901, and I was familiar with it.

The difference between the extension, of my sketch, and the corresponding part, which is a 3, in the Swan Patent Exhibit and the part shown in metal in Defendant's Exhibit Swan Reamer is that in my reamer the central spreading bar was a straight bar. The slips contracted on the end and spread over the end of the underreamer. In the Swan they were wedge-shaped, and the slips of the Swan had no tilting action on the key as mine had. My reamer had a tilting action, the cutters tilt on the key so as to allow the cutters to close around the end of the underreamer so as to collapse. It will be utterly impossible for my reamer to work by putting a key through there without the key-seat, somewhat larger than the cutters, to allow the slips to partake of the tilting action in the key. I did not borrow that tilting action from the Brown. The Brown has no key-seat in the cutters.

In my reamer, I had a spring carried rod with a key going through the rod, and the key laying in the key-seat of the cutters. The key-seat in the cutters was made somewhat larger than the key so as to allow the reamer to partake of the tilting action and collapse.

Now, then, the Brown reamer did not have any

(Testimony of Edward Double.)

key-seat or any spring carrying rod to carry the cutters. The spring actuated rod and the key and key-seat were well known to me but not used in the combination that I used them. The Swan reamer key-seats fit the key tightly and don't allow any tilting on the key. That was the essential difference between the Swan and my reamer.

Without the engagement of the key-seat in the cutters you would not be able to get the pendulum in my underreamer.

XQ. 151. (By Mr. BLAKESLEE.) Well, let us assume that to be a fact, and put it this way: Assuming that the cutters in the Brown reamer were so suspended that they could swing and the [800] cutters of your alleged conception of June 8, 1901, were so suspended that they could swing, will you please state what difference in principle you evolve between the swinging action of the Brown cutters and the swinging action of your cutters?

A. I don't think it would make a satisfactory job.

Mr. BLAKESLEE.—That answer is not responsive, your Honor, it does not refer to any difference.

The COURT.—Just a difference in the result, in the action.

Mr. BLAKESLEE.—I want to know what the distinguishing difference is from his viewpoint.

The COURT.—Answer the question further.

The WITNESS.—Give me the question.

(Question read.)

A. My cutters swing on a key and the Brown cutters swing on a bracket—I don't know what you

(Testimony of Edward Double.)

would call that center piece in the Brown.

XQ. 152. (Mr. BLAKESLEE.) That is the only distinction pertaining to principle that you wish to make between the swinging cutters of the Brown reamer and the swinging cutters of your alleged conception? A. Yes.

Some of the features of patent #796,197 are in patent #734,833 are embodied in the other. Some of the features embodied in one are embodied in the other. In pointing out any differences in principle or essential mode of operation as between those two patents, I will say, that in patent 796,197 there is a removable end block. Removable block is number 12. In patent #734,833 the block in the reamer is solid and there are dovetailed ways cut on the sides of the reamer. Those dovetailed ways are part 9.

XQ. 160. I call your attention to the specification of this patent as follows, on page 1, in the second paragraph, the [801] right hand column: "As shown, this end block 10, is provided with the hollow upward extension 10', extending up within the central bore 4, or shoulder 4' abutting against the shoulder 10'." Will you please show me where the part 12 is joined with part 10'?

A. Yes. This is joined with 10' (indicating). This is one solid block from here up to here (indicating); open to this pin through here, holding that in the reamer (indicating).

XQ. 161. And that pin entered into these openings in the legs 3, is it not? A. It is.

XQ. 162. Then this end block is not separable from the part 10', is it?

(Testimony of Edward Double.)

A. Yes, it is separable from 10'. The body here (indicating), is that what you mean?

XQ. 163. 10'.

A. 10', it is this body here (indicating).

XQ. 164. And is that one piece or two?

A. This is one piece down here (indicating).

Mr. BLAKESLEE.—I object to the witness referring to that.

Mr. LYON.—He has a right to look at the specifications to get what the particular numerals refer to.

Mr. BLAKESLEE.—I don't object to that, but I object to—

Mr. LYON.—He has a right to refer to that.

The WITNESS.—This piece runs from here down to here, is one piece, and in this body through this hole here to this point (indicating).

XQ. 165. (By Mr. BLAKESLEE.) Then that pin likewise holds part 10' as well as part 12, is that correct?

A. 10', is that referred to in the specification?

XQ. 166. I mean the part the line leads to.

Mr. LYON.—It is a question of what he refers to.
[802]

Mr. BLAKESLEE.—He ought to know without referring to the specifications, what he invented.

Mr. LYON.—You can tell, I suppose, every one of these patents yourself, you haven't seen for years, what each reference refers to?

Mr. BLAKESLEE.—I think I can.

Mr. LYON.—I doubt it.

Court adjourns.

(Testimony of Edward Double.)

(By Mr. BLAKESLEE.)

XQ. 167. You were attempting to inform me yesterday when the session closed—

The COURT.—How much longer is this going to take, the expert part of it?

The BLAKESLEE.—What I intend to do briefly is to get a clear statement of what the exact conception was that this man had,—what his invention was,—and to fix that by tracing its relation to what had gone before, to his knowledge; and the experting part I think can be done on argument. I do not think it will need any further explanation in view of the record in the case taken by the examiner.

The COURT.—I will require you to conclude that within the next half hour.

Mr. BLAKESLEE.—However, I take it, that will not limit me to going farther in the development of this conception—

The COURT.—No.

Mr. BLAKESLEE.—(Continuing.) —and leading up to the invention in suit. This, of course, is not the specific invention in suit.

The COURT.—The matter of the conception, you will not be limited in that way, regarding these discussions right around the time of the invention. I do not think you are going to get anything that you cannot show in half an hour regarding what his conception was. [803]

Mr. BLAKESLEE.—Anything pertinent to the subsequent steps, of course, would be another question, that is, when he made the first device, and so forth.

(Testimony of Edward Double.)

XQ. 168. (By Mr. BLAKESLEE.) You were attempting to point out to me yesterday just what parts of the drawing shown in patent 796,197—

The COURT.—I have not that before me. Have you got a copy?

Mr. BLAKESLEE.—Yes.

XQ. 168. (Continuing.) were connected with the part marked 12, in figure 2, that is, connected together in one unitary construction. Can you inform me as to that?

Mr. LYON.—I object to the question as ambiguous, uncertain and unintelligible. The difficulty with it is going to be when counsel attempts to make any use of the evidence in the argument of the case, it does not show to what it refers. Does counsel refer to the underreamer as built, or the conception, or the conception of Mr. Double at first, or to the showing of this patent?

Mr. BLAKESLEE.—I think the question speaks for itself.

The COURT.—If the witness understands the question—

Mr. BLAKESLEE.—That is the criterion.

The COURT.—Objection overruled.

The WITNESS.—The faces marked 12 is the faces that these cutters expand around the end of the bridge block.

XQ. 169. And are there any other parts shown in that drawing which are the same piece with the bridge block?

A. Why, the pin goes through the bridge block

(Testimony of Edward Double.)

and would secure the bridge block in the reamer.

XQ. 170. Well, is the part to which the line leads in figure 3 marked No. 10', directly—

The COURT.—Figure 3? [804]

Mr. BLAKESLEE.—Yes.

XQ. 170. (Continued.) Directly solidly connected with the part having the faces, 12, or is it separate, or separable?

A. We have complete working model, of the wooden model in this case and I would request the attorney to explain to me on the wooden model what he refers to.

XQ. 171. I asked you what you understood from that drawing when you swore to that application for this patent, and what your understanding of the patent now is from this drawing.

A. I can make a complete explanation of every part of that reamer to you.

XQ. 172. I ask you to answer the question which I put last, and which is unanswered.

The COURT.—If you want to use the wooden model to answer, if you can make the answer plainer to the court, you have a perfect right to do so.

The WITNESS.—Read the question.

(Last question read by the reporter.)

A. The faces, 12, and the blocks, 10, are one and the same piece, which I would like to show on this model, as I understand the question.

Mr. BLAKESLEE.—We suggest, your Honor, that the witness should know from his own knowledge how this is put together.

(Testimony of Edward Double.)

The COURT.—It might educate the Court if he can do it that way better.

Mr. LYON.—Step up and show it to the Court.

Mr. BLAKESLEE.—Does it not educate the witness?

The COURT.—I think if he is not educated by this time he will not be, in view of what is established.

The WITNESS.—This point marked 12 represents the spreading faces of this block, or bridge, this part 10. [805]

The COURT.—10' is what he asked about.

Mr. BLAKESLEE.—10'.

XQ. 173. (By Mr. BLAKESLEE.) The line leads from 10'.

The WITNESS.—Doesn't 10 there (indicating) lead to this part here (indicating), or lead to the body?

XQ. 174. The line from 10' leads right to that point and dies away and there stops in the part I am asking about.

A. This (indicating) is one piece, the bridge block.

Mr. BLAKESLEE.—Let it be shown on the record the witness, by referring to tag on exhibit, Defendant's Exhibit Wooden Model of Double Reamer Patent 796,197, answers the question.

XQ. 175. (By Mr. BLAKESLEE.) Now, in accordance with your original conception, was it possible to remove the cutters from the key and the spring actuated rod, without detaching that block, having the faces 10 and the part 10'?

A. It was not.

(Testimony of Edward Double.)

XQ. 176. In the reamer of this patent and of your conception, as you tell us about it, the ends of the cutters suspended from the key were supposed to slide along the key as the cutters tilted; is that not so?

A. In which direction do you mean, slide?

XQ. 177. Well, they would slide in one direction if the cutters were collapsing, and in the other direction if they were expanding, wouldn't they?

A. Yes, they had the tilting action as the cutters collapse; they had the tilting action on the key.

XQ. 178. My question was one which admitted of the tilting action, but I asked you if the ends of the cutters which were suspended by the key did not slide on the key as the tilting took place.

A. Which end do you mean? Point out on the model the end that you mean slid on the key. [806]

XQ. 179. Didn't one end of each cutter connect with the key, was it not supported by it?

A. Yes, cutters were supported by the key.

XQ. 180. And did not that end slide on a key as the cutter tilted?

A. Which end, the top end or the bottom end?

The COURT.—You mean slide up and down, or in and out?

XQ. 181. Slide on the key in any manner.

A. They would slide in and out so as to allow the cutters to partake of a tilting action around this central spreading bar of the reamer.

XQ. 182. And that was true of the upper ends of the cutters of the Brown reamer, was it not?

(Testimony of Edward Double.)

A. The Brown had no key for the cutters to slide on.

XQ. 183. However, the upper ends of the cutters did slide upon the parts you call the brackets in the Brown device; is that not so? A. Yes.

I first discussed this reamer with Mr. Dinger. That was approximately thirty days after I conceived that reamer. As Mr. Dinger did the first work on the reamer he was naturally the first man I would discuss it with. [807]

EDWARD DOUBLE, recalled—Cross-examination resumed.

XQ. 186. And when did you first discuss it with Mr. Jones?

A. To the best of my recollection, during the month of July, 1901. I next discussed it with Mr. Weekly, a few days after discussing it with Mr. Dinger. It was sometime during July, 1901, that I conceived the underreamer disclosed in Patent #734,833.

In regard to my testimony yesterday I wish to state in regard to that conception of June 8, that I had that testimony confused with the conception date and the manufacturing date. The manufacturing was started July 8, and the conception date was some time during the month of June.

XQ. 199. Can you state the circumstances surrounding your alleged conception of the subject of this patent 734,833, how came it about that you hit upon that conception?

A. I finished, practically finished up the concep-

(Testimony of Edward Double.)

tion of my first reamer, as the model just explained, and it was a hard thing to manufacture—hard proposition to manufacture, and I conceived the idea of cutting out the sides and putting in these dovetail slip-ways in making the spreading bar, or bridge block solid with the main part of the reamer. That is during the latter part of July, 1901.

The COURT.—Just a moment. Those changes were then that you made this dovetail to direct the cutters up and down and changed this spreading block? A. Yes, this was the latter part of July.

The COURT.—Those are changes.

The WITNESS.—Those were changes made.

It was between the middle and the latter part of July that I made those changes as shown by conception disclosed in patent #734,833. Shortly after my ride through the fields with Mr. Stewart [808] in which underreamers were discussed I hit upon the real idea of the underreamer while in my office.

We offer in evidence the sketch made by him (Mr. Double) yesterday in pencil on a yellow sheet of paper and ask that same be marked "Defendant's Exhibit Double Reamer Sketch of 1916."

XQ. 207. (By Mr. BLAKESLEE.) In connection with this Brown reamer, are we to understand you consider that that was in certain respects defective? A. I consider it an impractical tool.

XQ. 208. And yet, subsequently to that time, in the year 1902, your company traded a half interest in patent No. 687,296, which was issued exactly a month after your application for the patent in suit

(Testimony of Edward Double.)

was filed, for a half interest in the patent in suit; is that not correct?

A. I don't think it was our company; it was myself personally.

XQ. 209. Please state the circumstances.

A. They had brought this model or had shown me that model in the St. Elmo Hotel, and I had looked it over, and was not satisfied it was a practical or workable tool, and went and got out this reamer of my own, and after I had gotten out this reamer, they threatened me with suit. And in order to avoid any litigation, and not knowing what the future of the reamer business was going to be, that we compromised and I assigned them a half interest in the application I had pending for a half interest in their application.

Mr. BLAKESLEE.—In this connection we offer in evidence certified copy from the digest of the United States Patent Office of all assignments, agreements, licenses, et cetera, pertaining to the patent in suit, and call particular attention of the Court— [809]

Mr. LYON.—Wait a minute. We object to counsel reading in the record and stating what the document purports to be. Let me see a moment.

The COURT.—You will have to wait until it is admitted before you elaborate on it.

Mr. BLAKESLEE.—We offer in evidence as showing the transaction which took place pertinent to the Brown patent which has been issued, and the Double invention.

(Testimony of Edward Double.)

Mr. LYON.—We object to this as being fragmentary, and incompetent and inadmissible for any purpose in this case. Now, if they want to prove them they must get certified copies of the original file and produce them. Their whole transaction is set up in the bill of complaint, but this document is simply an abstract showing that certain instruments were recorded, and it is mere recital, and there is no statute authorizing such a certificate by the commissioner of patents at all. He is permitted to make certified copies of any papers which are of record in his office. This is not such a paper. This is just an abstract of portions of papers, in other words a digest. And the only way they can prove those, if they want to prove them that way, is to call for the original or have certified copies of the file made.

The COURT.—Objection overruled.

Mr. BLAKESLEE.—As a matter of fact, the bill of complaint does not set out the Brown assignment at all. We would ask it be marked certificate of digest of patent office records re Brown patent.

XQ. 211. (By Mr. BLAKESLEE.) I want to know what you consider you did with respect to your second conception of July, 1901, that you had not done with respect to your conception of June, 1901, in the reamer line. [810]

A. Well, I incorporated this solid tongue spreading bar, also tapered dovetail slipways in combination with the key; and also made it possible to make the bottom end of the reamer solid, doing away with the removable end block.

(Testimony of Edward Double.)

XQ. 212. That bottom portion which you say you made solid is referred to in the patent as "hollow slotted extension," is it not? A. Yes.

XQ. 213. And as far as it being made solid with the body was concerned and as far as it being a hollow slotted extension is concerned, those features were both present in this Swan reamer known to you at that time, were they not; is that not so?

A. They were not.

XQ. 214. Please state the difference.

A. On my hollow slotted extension the dovetail on the outside was the opposite direction, and the opposite angle of what the Swan was; and my central spreading bar was a straight or parallel bar, where the Swan reamer was a tapered bar. On the Swan reamer he had no projection on the cutters so as to allow them to come around and lock against the spreading bar of the reamer and hold the reamer in back against the casing while the reamer was going down through the casing.

The COURT.—You were not asked about the cutters. He simply asked about the difference in dovetail.

The WITNESS.—(Continuing.) The dovetail in combination with the hollow slotted extension was different than the Swan.

XQ. 215. (By Mr. BLAKESLEE.) My question was as to whether there was a hollow slotted extension solid on the body of this July, 1901, conception, in comparison with a hollow slotted extension solid

(Testimony of Edward Double.)

on the body of the Swan reamer, and in that respect were they not identical?

A. They were not identical. [811]

XQ. 216. Both had hollow slotted extensions, had they not? A. Both had hollow slotted extensions.

XQ. 217. The Swan reamer as well as the reamer you proposed in July, 1901, had slips, or cutters, guided by means of dovetails in connection with dovetail-ways on the hollow slotted extension or on the lower end of the body. Is that not correct?

A. Yes, they had cutters mounted on the hollow slotted extension.

XQ. 218. And they both were guided by means of flanges or dovetails co-operating with the flanges or dovetails on the lower end of the body; is that not correct? A. They were.

I was not acquainted with the O'Donnell and Willard underreamer prior to my invention of my reamer. I have since seen it, but have not made a personal examination of it. Not to the best of my recollection have I been on the property of the Fidelity Oil Company prior to June 1, 1901.

XQ. 221. Have you since that time seen patent issued to O'Donnell & Willard, No. 762,435?

The WITNESS.—If I could see where this was—

Mr. BLAKESLEE.—I have not suggested to him anything he knew before.

Mr. LYON.—He never saw this, he said.

The COURT.—Objection overruled.

Mr. BLAKESLEE.—I want to show if he followed this in its conception.

(Testimony of Edward Double.)

Mr. LYON.—He said he never saw it before.

XQ. 222. (By Mr. BLAKESLEE.) Copy of which I now hand you. A. I had.

XQ. 223. Prior to June or July, 1901, had you seen any device [812] substantially in accordance with the drawings of that patent? A. I had not.

XQ. 224. Had any disclosure of it come to you in any way? A. No.

It is my best recollection that I first met Mr. O'Donnell after removing our shop from Santa Paula to Los Angeles, which was the latter part of 1901 or the early part of 1902.

Mr. Jones was never nominally in charge of the shop during my administration. Mr. Walter Weekly was sometimes put in charge when I would leave the shop.

XQ. 234. You were assisted considerably by Mr. F. W. Jones, after you came to that shop, were you not, in matters of shop detail and management?

A. I was not.

XQ. 235. Did not Mr. Jones instruct you how to make sketches and drawings for shop work?

A. No.

XQ. 236. Where did you obtain your instructions to make sketch drawings?

A. I picked it up myself from time to time.

XQ. 237. You had not done much of it before you came to that shop, had you?

A. No, not very much; only pencil sketches.

XQ. 238. Was there anybody in that shop who did the jobs of drafting as required besides Mr.

(Testimony of Edward Double.)

Jones? A. Nobody to my recollection.

XQ. 239. He was rather relied upon, wasn't he, when those occasions arose? A. He was not.

The underreamer exhibit in June, 1901, was my first invention.

The reason I did not apply for patent on reamer #796,197 until I had applied for patent on #734,833 reamer was I had supposed [813] after filing my first application that I had covered all the points in both applications, but Mr. Lyon suggested filing additional application to cover the removable end block features which were not covered in the first application. In other words, the claim in application in #734,833 did not cover all the parts of the first reamer I manufactured. Patent #734,833 would not cover some of the features of the first form. ' It would not cover the removable end block.

XQ. 247. (By Mr. BLAKESLEE.) Well, please state a little more definitely, how you understood the removable hollow slotted extension would not be covered in the application or in the patent to issue on the application made, as filed?

A. Mr. Lyon had explained to me that was a different application, a different way of putting the block in, and suggested making the application, which I did.

XQ. 248. In other words, you understood that one patent was to be for the solidly attached hollow slotted extension, and the other was to be for the removable hollow slotted extension; is that correct?

A. Yes.

(Testimony of Edward Double.)

XQ. 249. Now, how soon did you get to work on a reamer like that of patent 734,833 in suit, namely, the one which you say you conceived in July, 1901?

A. Immediately after the completion of the first reamer.

It took probably three or four weeks to complete the reamer in suit. Started about the first of August. Tried out immediately upon completion. From that time on we have been manufacturing continuously.

We have made some changes on that reamer since that time. Some improvements. I never saw one of the Oil Well Supply Company's catalogues showing cut #2161 until Mr. Lyon called my attention to it.

That was in 1902. [814]

I don't know whether the Canadian reamer cutters tilt or swing, according to their drawing. From the cut I cannot tell whether the cutters would tilt or swing. Looks as though these cutters would swing instead of tilt. It looks as if the pin going through that central bar went through both cutters.

XQ. 271. In other words, you would make it out that that pin was a fixed center for the cutters to swing on; is that it?

A. Yes, like a pair of scissors would be pivoted.

XQ. 272. Then the difference between that and tilting concerns the moving or sliding of the cutters on a key. A. Yes.

XQ. 273. Is that it? A. Yes.

XQ. 274. Now, as a matter of fact, it was prior to

(Testimony of Edward Double.)

the time that you had your second reamer conception that you saw a Jones round-nose underreamer like Defendant's Exhibit Wooden Model of Jones Underreamer; is that not so? A. It is not so.

XQ. 275. Can you place, a little more definitely, the time that you first saw such Jones round-nose reamer?

A. I believe I placed the time yesterday afternoon at approximately the month of August.

XQ. 276. In other words, you would make it substantially two months before the 26th of October, 1901, when you applied for patent No. 734,833; is that correct? A. Approximately so; yes.

XQ. 277. It occurred to you upon seeing that, didn't it, that the dovetail action of the body and the cutters in that Jones round nose reamer was a good thing?

A. It did not, for I was cutting out my dovetails before I seen the Jones underreamer, on my underreamer. [815]

XQ. 278. But, as a matter of fact, you had not started work on any Double underreamer with dovetails before you saw this, had you, before you saw this Jones, had you?

A. To the best of my knowledge, I had.

XQ. 279. Those times were very close together, were they not?

A. From the start of my dovetail reamer to seeing this round nose reamer?

XQ. 280. The time of first making your reamer

982 *Wilson & Willard Manufacturing Company*

(Testimony of Edward Double.)

734,833 and the time of your first seeing this Jones round nose reamer.

A. Yes, the time was approximately close.

XQ. 281. You couldn't say whether it was a day, could you, or within the space of a week, or three days, or how much?

A. No, I couldn't state approximately positive.

XQ. 282. You fix it in your mind, do you not, as being practically coincident in point of time?

A. It was after Jones had left the employ of the Union Oil Tool Company.

XQ. 283. Did you go out with the first reamer with the detached hollow slotted extension on the occasion of its attempted use in the field?

A. To the best of my knowledge, I did.

XQ. 284. Now, are you able in any way to definitely fix that time?

A. That was the latter part of July, 1901, to the best of my information.

XQ. 285. Had not Mr. Jones left the shop of the Union Oil Tool Company at that time?

A. He had.

XQ. 286. Then might it not be that you saw the Jones round nosed reamer in July, 1901, inasmuch as you say you saw it after Jones left this shop? [816]

A. No, because I conceived the idea of dovetail ways and explained it to Mr. Jones before the reamer had left the shop, the change of construction I was going to make on the next type of underreamer.

XQ. 287. Then you feel quite sure that you had

(Testimony of Edward Double.)

not seen a pocket model of that reamer before that date?

A. To the best of my knowledge I never saw a pocket model of that.

QX. 228. Will you say so positively?

A. To the best of my knowledge I never seen one of those pocket models.

XQ. 289. Have you no recollection one way or the other? A. I have no recollection of seeing it.

XQ. 290. Are you able to say, and I will ask you to say yes or no, as to whether you had seen such a round nose Jones reamer, small model, before Jones left your shop? A. I did not.

XQ. 291. Did you make, in working out your ideas of the second reamer like the patent in suit, sketches following the same procedure you did the first one?

A. They were rough pencil sketches made. At that time at Santa Paula we had no draftsman and all the work was done from pencil sketches and the sketches were not exactly correct and when it would get in the shop it was a proposition of cutting [817] and trying until we got it working right.

XQ. 292. I thought Mr. Jones was there available to help you in drafting, as you said.

Mr. LYON.—He has not said that Jones made any drawings for him.

Mr. BLAKESLEE.—Please let me examine the witness. If he wants to correct—

Mr. LYON.—You are saying something, that the witness has made a statement.

The COURT.—He said Jones was there.

(Testimony of Edward Double.)

Mr. LYON.—“As you said.”

Mr. BLAKESLEE.—This is cross-examination.

The COURT.—Objection overruled.

The WITNESS.—Give me the question.

(Question read.)

A. Mr. Jones was not employed as a draftsman. He was employed as a machinist with the Union Oil Tool Company, lathe hand.

XQ. 293. (By Mr. BLAKESLEE.) Well, you at least utilized him as a draftsman, did you not, at times? A. I did not.

XQ. 294. He did not make any drawings under your suggestion or suggestion for use in the shop while he was there?

A. No drawings, to the best of my recollection.

XQ. 295. He did not work on any drawings in your office?

A. Not to the best of my recollection.

XQ. 296. You knew he could make drawings, didn't you?

A. I didn't know anything about his ability as a draftsman.

Mr. BLAKESLEE.—Now, we will ask that the witness produce a rough sketch similar to the one in evidence, only showing the substance of the sketches as made in connection with the second reamer conception.

Mr. LYON.—That is objected to, if your Honor please, as a waste of time. [818]

Mr. BLAKESLEE.—We want to know as fully as

(Testimony of Edward Double.)

we can what this witness proposed to tell us he did with this invention.

The COURT.—Objection sustained.

I think George C. Chatterdon shipped the model of Brown reamer to us at Santa Paula. I had been invited to the St. Elmo Hotel to take a look at that model and after looking it over they was to send it to Santa Paula and eventually did send it to Santa Paula. It laid in our office there for some time. I believe it is still in our possession. We received it sometime during the month of June, 1901. It was before we had completed my first reamer.

The people at the St. Elmo Hotel were trying to interest the Oil Tool Company in manufacturing the underreamer for them. I believe I requested that it be sent to our shop. I went to the St. Elmo Hotel and looked it over, and it looked as though the reamer had some possibilities in it. The Chatterdon-Eckenhoffer interests had interest in it then and still have interest in it.

I probably discussed that Brown reamer with several of the boys but just who I cannot recollect.

XQ. 313. Are you positive that you did not discuss that Brown reamer device at Santa Paula with Mr. F. W. Jones at your shop?

A. Not to the best of my recollection.

XQ. 314. Can you name anybody with whom you so discussed it there?

A. Well, I probably discussed it with several of the boys coming in and out of the shop, but just the particular men I discussed that with now, I cannot

(Testimony of Edward Double.)

recollect. I wouldn't say I didn't discuss it with anybody.

XQ. 315. Then you don't remember any specific individual with whom you discussed it, but at the same time you are sure, are you, that you did not discuss it with F. W. Jones?

A. We may have commented on the thing, seeing it in the office. [819]

XQ. 316. Mr. Jones was in your office more or less frequently, wasn't he, at that shop at that time?

A. Not any more than any other employee would, coming in for their orders.

I had been foreman of the shop at Titusville, Pennsylvania, before coming to California and I never had seen an underreamer until I came to California. I was in business in Titusville, Pa. Double & Herlehy. There was no use for underreamers there. We cased the wells and the formation stood up.

I have not the first reamer made of patent 734,833.

Testimony of Chas. A. Buffington, for Complainants.

Testimony of CHAS. A. BUFFINGTON, witness called on behalf of complainants, testifies as follows:

I am 36 years old; occupation, machinist. I am employed by the Union Tool Company at present. Have been a machinist for nearly sixteen years, having commenced work with Klien Bros. at Marietta, Ohio.

Arrived at Santa Paula, California, July 13, 1901. I went to work for the Union Oil Tool Company on the 14th of July, 1901.

(Testimony of Chas. A. Buffington.)

I met Frederick Jones shortly after that time. He was working at the Skinner shop.

Do not remember the work I did the first day or two I was with the Union Oil Tool Co. After having been there a week or so I did some work on an underreamer they were assembling and there was a mandrel which was a little long and they asked me to cut it off and re-thread it. The mandrel carried the slips and worked inside the spring and carries the cutters of the Underreamer. Think I would know that reamer if I saw it now.

(Testimony of witness interrupted until after reamer is produced. [820])

Testimony of B. N. Youngken, for Complainants.

Testimony of B. N. YOUNGKEN, called on behalf of complainants, testifies as follows:

I was employed in the Union Oil Tool Company's shop during the year 1901. I was in that shop until the latter part of March or the first part of April, 1901. I then went to Los Angeles and did not return thereafter during the year 1901.

Of my personal knowledge I know nothing concerning the manufacture of that first Double underreamer.

I am acquainted with F. W. Jones.

On instructions of telephone message from Mr. Frederick Lyon last year, I went to Mr. Jones' ranch at McFarland to see him, and to ascertain the date of making of reamers in Santa Paula of his invention. Jones told me Mr. Wilson had been to see him also, and he refused him the information unless he

(Testimony of B. N. Youngken.)

was paid for it. Stated that he wanted a thousand dollars. The next day or day thereafter I met Mr. Lyon at Bakersfield and took him to Mr. Jones' ranch. I had conversation with Jones that day and had dinner with him at his ranch. Mrs. Jones cooked the dinner. Mr. Jones, Mr. Lyon and myself talked over these Reamer matters while Mrs. Jones was cooking the dinner.

In regard to Mr. Jones' statement that Mr. Lyon offered \$250 if Jones would say nothing about these underreamers in these cases will say: Mr. Lyon informed Mr. Jones that he had nothing to sell and that he would allow him—he first said he would not come to Los Angeles unless he might bring his family down, and it would be necessary for him to put someone in charge of his place while he was down here, and Lyon said that would be all right and if necessary Lyon would allow him up to \$250 for expenses to come down and look up witnesses, gather such data as might be necessary to have on this case. That Lyon also informed him that he could bring him down with subpoena, and all that he would be paid and all that the Court would allow would be his mileage and his witness fees. [821]

Mr. Jones stated that \$250 was no object to him at all. He would not bother with it for that money. He said that the other side had been negotiating with him and offered him more than that. A few days later I served a subpoena on Mr. Jones and his wife to testify in Bakersfield. Jones did not say who had offered him more than \$250—he simply said the

(Testimony of B. N. Youngken.)

other people. I know only from inference to whom he referred.

XQ. 30. And you can't state exactly what Mr. Jones said in that connection?

A. Only that he had communicated with Mr. Wilson and had some letters from him asking him to give his testimony or get the information from him. Jones wanted a thousand dollars for his right and he would testify. He stated that Mr. Wilson had explained to him that he had some rights in this suit; that he had been cheated out of the invention. Mr. Lyon did not offer him \$250 to keep out of the case.

I was not with Mr. Jones and Mr. Lyon every minute of the time the dinner was being cooked, hence I am not able to say of my own knowledge all that Mr. Lyon said to Mr. Jones at that place and on that date. Mr. Lyon told Mr. Jones that he had nothing to sell and that he had nothing which Mr. Lyon would buy.

I am at present employed by the Union Tool Company. Have been ever since that time.

Testimony of Frederick S. Lyon, for Complainants.

Mr. Lyon testifies as follows:

My name is Frederick S. Lyon; I am counsel for complainant in this case. In July of last year I phoned Mr. Youngken to locate Mr. Jones, Frederick W. Jones, as I wanted him for a witness Case A-4 pending in this court. I received a telephone communication from Mr. Youngken, and in response to that I met [822] Mr. Youngken in Bakersfield and proceeded to Mr. Jones' ranch, and had a con-

(Testimony of Frederick S. Lyon.)

versation with him. Mr. Jones stated that Mr. E. C. Wilson had been up to see him and that he had given him no information whatever and that Mr. Wilson had stated that he had some rights in connection with the old underreamer matters and Mr. Jones stated to me that he would not come down to Los Angeles unless he be paid a thousand dollars. I told him that he had no rights that he could sell to anyone, but that it would cost the complainant a considerable amount of money to take his testimony up there and to hunt up the corroborating witnesses to show that this old Jones reamer with the removable bowl was made and sold by him in 1902. I remarked to Mr. Jones that he knew I knew the facts in regard to such reamers, and he said that he knew I knew. I offered him \$250, not to exceed \$250, for his expenses if he would come to Los Angeles, give his testimony in that case, assist me in finding the men who had used his removable bowl reamer, and the old records of the old shop. That was the substance of that conversation. I did not offer him any money or sum whatever for him keeping his mouth shut or remaining out of this litigation, or anything else. To the contrary, I told him that day that if he did not want to come down to Los Angeles I would subpoena him when I wanted him.

**Testimony of W. S. Dinger, Called as Witness on
Behalf of Complainants.**

Mr. Dinger testifies as follows:

I am a blacksmith; I have been in the business for twenty-three years. Am employed by the Union

(Testimony of W. S. Dinger.)

Tool Company. Came to California in 1900. Went to work for the Union Oil Tool Company, Santa Paula. Mr. Double was in charge. Went to work about the 12th of April in 1900. Came to California to go to work for that company.

Met Fred W. Jones, who was a machinist in that shop, he being there when I went to work. [823]

Q. 21. Who was in charge when Mr. Double was away during that time, if anyone?

A. Well, there was Mr. Weekley, after he came there; I have seen the time he has gone away and not left anyone in charge and when he was away for a short while.

Mr. Double left no one in charge while he was away.

I remember an underreamer being manufactured in that shop.

Double came to me and stated that he wanted to build an underreamer. Said he had conceived the idea of an underreamer and thought he would go ahead and make it up at the first opportunity we had time. He and I discussed how we would make it up. I don't know whether that was the latter part of June or the first of July of 1901.

I forged the body under Double's instructions.

Q. 38. Did you have any drawings?

A. Well, no, we didn't have any drawings of regular form—blue-prints or anything of that kind—pencil sketches that Double give us. The forging went to the machine shop where Double was in charge.

(Testimony of W. S. Dinger.)

I had no conversation with Mr. Jones about it. Weekly turned it up, that is, he did the machine work on the body. Mr. Terriberry assembled it, I believe. I forged the cutters myself. Jones had nothing to do with making or building of that reamer. At that time Jones was in the Skinner shop.

Q. 49. Did you have any drawing-room or extensive drawings of any kind at the shop of the Union Oil Tool Company for any device of any kind during the years 1900 and 1901?

Mr. BLAKESLEE.—Object to that as calling for the conclusion of the witness, the witness not having qualified to testify as to what properties and drawings were in the shop. [824]

The COURT.—It is more or less objectionable. Objection overruled.

(Last question read.)

A. No.

Mr. LYON.—You may inquire.

In regard to work I did when I first went in that shop will say that, I wouldn't say positively whether it was tools to make from jars or jars. I can't just recall who they were made for. I think they were 6 $\frac{1}{4}$ ". Can't tell any particular jobs we did in the latter part of 1900.

XQ. 63. Why is it that this underreamer job along in 1901 stands out so clearly in your memory?

A. Well, it was something new that we had never made in the shop before.

XQ. 64. How recently have you discussed that reamer with Mr. Double? A. Recently?

(Testimony of W. S. Dinger.)

XQ. 65. Yes. A. Well, the last few days.

XQ. 66. Mr. Double told you when you worked on it, didn't he? A. No, sir.

I also discussed it with Mr. Lyon and Mr. Buffington. During the last seven days Mr. Buffington and Mr. Terriberry mentioned something about the date July, 1901, to me.

I cannot mention any particular work or piece of work I did during 1901, but after July of that year. I recollect it was 1901 that we worked on that reamer because it was just before we came to Los Angeles, about six months before. Can't remember anything we did or any job I did during those six months prior to finishing the first Double underreamer and moving to Los Angeles, unless it was jars or general run of work. I remember of making some elevators, but I don't remember what part of the six months [825] it was. The work I did on my fire was jars, fishing tools, stems, and that class of work.

A. John A. Richardson also worked in the blacksmith's shop at that time. He ran a small fire.

Mr. Weekly worked over at the Skinner shop for awhile in 1901. Jones worked there in June, July or August in 1901. Weekly worked there before Jones went to that shop. Am sure Jones worked there after June of 1901. Don't remember how long he worked there. It may have been in May that Jones severed his connection with the Union Oil Tool Company and went over to work with Mr. Skinner. He worked for the Union Oil Tool Company while he was there in the Skinner shop. Don't

(Testimony of W. S. Dinger.)

know he continued in the employ of the Union Oil Tool Company when he went over there to go with Skinner. As I understand it, Jones was connected with the Skinner business; he was also doing work for the Union Oil Tool Company. After he went to work at the Skinner shop I never saw him back working in the Union Oil Tool Company's shop. I don't know whether he did any work in the Skinner shop before he went over to the Skinner shop to stay there or not.

The COURT.—Let me understand you: You have already said that you are sure that he worked for the Union Oil Tool Company at the Skinner shop before, as I understand you, he went over and went into business with Skinner. Now this last answer seems to be just contrary to that. You state of your own knowledge what you mean.

The WITNESS.—I understood him to say whether he severed his connection with the Union Oil Tool Company when he went over to the Skinner shop I was working for the Union Oil Tool while he was over there and transferred the work back and forth while he was working at this shop at times, as I understand it.

I think all the people who worked on that first Double reamer were Mr. Weekly, Mr. Thomas, Mr. Terriberry, Mr. Buffington [826] and I think Mr. Gibson did a little work on it too, but I would not say as to that. I think Mr. Jones was in the Skinner shop when that first reamer was being made in the Union Oil Tool Company's shop; I think it was July.

(Testimony of W. S. Dinger.)

We ask that the reamer produced by complainant, namely, the first reamer referred to by this witness and by the witness Double be offered as "Defendant's Exhibit First Reamer, 1901."

Also ask that the Brown model be marked as stipulated on Saturday, as "Defendant's Exhibit Model of Brown Reamer, 1901."

Weksmith, the blacksmith who had run the large hammer, had an accident and was knocked out to a certain extent, and that is why I went down under this big hammer, to forge this reamer, and while forging that hammer a boy who was visiting us was around there quite awhile. That is the way I fixed the date as 1901.

I can fix the date as July as it was the second year in California and we had company visiting us that summer. I know they came that month. They were there about four weeks.

There were two sets of cutters forged with that reamer, and I forged them both. It was probably two months later that I did other work on that reamer. Made a second set of cutters. That is, after the first work was done.

Testimony of Charles A. Buffington, for Complainants (Recalled).

I will point out "Complainant's Exhibit Double's First Reamer," as the reamer to which I have referred as being the first reamer that I worked on in the Union Oil Tool Company's shop.

The first work I did on that reamer was when they were assembling it. The mandrel was too long and

(Testimony of Charles A. Buffington.)

had to have about one inch and a quarter cut off of it. Mr. Terriberry and Mr. Gibson [827] were putting it together. Fred W. Jones was not in the shop at that time. I never saw him in the shop about that reamer during July, 1901.

Last fall I was working for the Regan Oil and Tool Company near Sherman. Mr. Jones called on me two different times, first to ask me if I remembered the date that I came to work for the Union Tool Company.

I do not know when Mr. Jones went over to the Skinner shop in 1901. I cannot state positively that he was working over there on the 14th of July, 1901, when I came to Santa Paula. I saw him working in that shop immediately after. After I got better acquainted with Mr. Jones he told me that he was drawing an underreamer, round nose block. The first I saw Mr. Jones there was probably thirty days after July 15. Some time long about the middle of August. He was working over there at the time I was, that I got acquainted with him, and the supposition was around that they told me he was working over there. I couldn't say that I had personal knowledge of his working over there prior to August.

Mr. Richardson, a blacksmith, was working at that time in the shop. He made no reamer cutters to my knowledge.

I also knew William B. Naugle, he was boiler maker at that place.

The last fire Mr. Richardson worked on was a coal

(Testimony of Charles A. Buffington.)

fire where they dressed the lathe tools and done light work, such as dressing cold chisels, lathe tools, making springs, and, well, I couldn't describe all that they done on it, but that is the nature of the work.

I should say it was about two or three weeks after I commenced work in the Union Tool Company's shop that the Double reamer was completed. Did not see Jones in the shop during that time.

Both I and Mr. Dinger are still working for the Union Tool Company. I went to work for the Union Tool Company about the 5th [828] day of December, 1915. Last Friday was the first knowledge I had that I was going to be called upon to testify. Mr. Double called me on the telephone and asked me what morning I commenced work with the Union Tool Company and I told him it was July 15, 1901. He said he might want me later. Since then I have talked with Mr. Lyon.

**Testimony of W. J. Terriberry, Called as a Witness
on Behalf of Complainant.**

Mr. Terriberry testifies as follows:

My name is W. J. Terriberry; age, 64; machinist. I am at present employed by the Union Tool Company. Was employed by their predecessor in Santa Paula and moved with that company from Santa Paula to Los Angeles.

Am acquainted with making the first Double underreamer in that shop. The original reamer is here (indicating) and the model is on the other side of it. It was manufactured along the middle of July, 1900, or 1901, at Santa Paula. I did work on

(Testimony of W. J. Terriberry.)

it. Gibson, Weekly and Dinger also worked on it. Dinger forged the cutters and the body. He forged two sets of cutters, $9\frac{5}{8}$ and $11\frac{5}{8}$. That reamer was built under Mr. Double's directions.

Jones had nothing to do with the manufacture of that reamer, because he wasn't in the shop. He was over at Skinner's. Mr. Richardson had nothing to do with the forging of the cutters of that reamer.

Mr. Double gave pencil sketches, told us what he wanted.

Mr. BLAKESLEE.—XQ. 41. Now, do you know anything about these sketches as far as their making was concerned? A. As far as their making?

XQ. 42. Yes.

A. Well, they are all the sketches I know of are made in the office.

XQ. 43. Yes, but who made them?

A. Double always did make them, everything I know of. [829]

XQ. 44. Did you see him make any sketches there?

A. Well, I have seen him make several.

XQ. 45. Of what? A. Different work.

XQ. 46. Didn't you see Mr. Jones in the office?

A. Mr. Jones?

XQ. 47. F. W. Jones.

A. No, sir; never saw him in that office to my knowledge.

XQ. 48. Never saw him in the office. What did you ever see Mr. Double make a sketch of?

A. Why, I have seen him make sketches of different parts of work that we were doing there, spears

(Testimony of W. J. Terriberry.)
and cutters, one thing and another.

XQ. And what kind of instructions did he give you about this first reamer, Complainant's Exhibit First Double Reamer?

A. Simply to fit them up according to his sketch.

XQ. 57. Were you constantly in touch with the making of this first reamer? A. Yes.

I testified in the interference suit between Edward Mills and Edward Double. I identified this same reamer at that time, July 14, 1903. That reamer was built under Double's instructions. At that time I did not hear any talk by anyone that Fred W. Jones had anything whatever to do with that reamer.

I was working under Double at that time. Double gave us pencil sketches and told us what he wanted. I did not see Double make those sketches. Double always did make sketches of everything I know of. I have seen him make several sketches. Have seen him make sketches of different work.

I never saw Jones in the office to my knowledge. The first instructions were simply to make them up or fit them up according to his sketch. [830]

I saw Dinger make the body, but Richardson may have made the key or something of that kind that he forged on. Jones was not in the shop at that time. He left the shop long about the first of July. Somewhere in there. He was over in the Skinner shop. He was working for the Union Tool Company over there, but what time he got through with the Union Tool Company I don't know. I never paid any attention to what Jones was doing over in the Skinner

(Testimony of W. J. Terriberry.)

shop or anything about it. He was not at the shop there or at the Union shop at that time, that is, part of the time, that is all the time from the time he went over to work for the Union Oil Tool Company he wasn't over at work in the Union Tool Company's shop. Between the first of June, 1901, and the 15 of July, 1901, Jones was in the Skinner shop, but I don't know how much of the time. Mr. Richardson may have made a key or forged a key for that first reamer. I couldn't say who made the spring, for that first reamer. Richardson might have made the mandrel, I am not sure about that. I put the spring in that first reamer myself; I got it from the storehouse. In my conversation with Jones last September or October there was nothing said about the first Double reamer. I don't remember anything of the kind that Buffington had anything to do with building the first Double underreamer at Santa Paula. Jones was not in the employ of the Union Tool Company at the time the first Double reamer was sent out for its trial by McGee.

It was returned in the latter part of July or first of August or somewhere in there. I saw it when it came back. I don't think Mr. Jones was in the employ of the Union Oil Tool Co. then. I know it was not October that that reamer came back the first time because it wasn't out for that short time when it came back.

Other reamers were manufactured in that shop after that first reamer came back; we made some

(Testimony of W. J. Terriberry.)

Austrian underreamers and we made some Double reamers. Probably a month or six weeks when we started another one. [831]

Testimony of George L. Skinner, for Defendant.

Testimony of GEORGE L. SKINNER, called on behalf of defendant, testifies as follows:

My name is George L. Skinner; age, 65; occupation, watchmaker and jeweler. During the years 1900, 1901 and 1902 I resided in Santa Paula and conducted a machine shop there. Did general machine work. About December of 1900 or 1902 I put in a shaper and put in a large twenty-six-inch lathe. That was a Flather lathe, I think, if I am not sure, I obtained it from Booth & Company.

I did work for the Union Oil Tool Company in Santa Paula, but my dealings with that company terminated something like five or six weeks after that Flather lathe was put in commission.

The first settlement I had after installing that lathe I found out I was getting no remuneration for the use of that lathe; consequently I quit, ended my services with them and dealings with them. Nobody from the Union Tool Company's shop worked in my place after that. Mr. Double and I ceased to be friends after that settlement. Because he would not allow me any extra for the use of the new lathe.

Mr. Terriberry from the Union Oil Tool Company's shop worked on that lathe. Also Mr. Weekly from that shop worked on my new lathe. Weekly, I think, worked only the one day. The equipment

1002 *Wilson & Willard Manufacturing Company*

(Testimony of George L. Skinner.)

was not strong enough to stand his work. He was a lightening joint turner. Youngken worked there for me for several days, at one time making some casing cutters. I cannot remember the name of any person besides Weekly, Terriberry and Youngken who worked there.

It might have been ten days or two weeks time in installing that Flather lathe. Possibly two weeks *from it* landed in the building before it was in condition to run. It might have been six weeks after that lathe came in my shop, I don't think it could have been any more than that, that I broke off my relations with Mr. Double. That would be an outside figure. [832]

I don't remember the date that Jones began to work in partnership with me. Couldn't give you the exact date, that the Union Tool Company and I quit doing business together. It could not have been long after that date that Mr. Jones and I went into partnership with each other. I would have to refer to my books to give you the exact date.

I am of the opinion, as I said before, that there were others besides Weekly and Terriberry who worked in my shop, but I couldn't name them. I don't know about Jones working there. I am not positive about that. He might have, but I don't remember of it, neither does my family. He couldn't have worked there long.

Testimony of Fred W. Jones, for Defendant.

FRED W. JONES, for Defendant, recalled to testify further.

To the best of my knowledge, I did do some work in the Skinner shop for the Union Oil Tool Company prior to the time I left the Union Oil Tool Company's employ.

Regarding Mr. Youngken's testimony that during the early part of August of last year I stated that the other people had offered me more than two hundred and fifty dollars for my interest, such as they might be, in this underreamer controversy, will say that I don't remember of hearing such conversation. I remember well where we were at the time when the conversation took place in regard to this money, and the time. We were sitting on the porch, after dinner, and I have already stated the conversation what took place as near as I could remember,

I have known Thomas O'Donnell for a number of years. I knew Thomas O'Donnell in Colorado long before 1890. That was before I came to California. I came to California from Arizona with the sole object of visiting Mr. O'Donnell. I met Mr. O'Donnell in Ventura County where he was working on the lease known as the Kentuck in the Sespe Canyon. I saw Mr. O'Donnell in Santa Paula many times after that. They lived there for a while. During the [833] month of May, June or July, Thomas O'Donnell was in Santa Paula, and he was at the shop, and I remember introducing him to Mr. Double and Mr. Double said he had already met Mr. O'Donnell.

At one time while in the employ of the Union Tool

(Testimony of Fred W. Jones.)

Company shop and while Mr. Double was in charge he said to me, "You will have to mark your time, time and a quarter from now on." And I said, "that I would not do it." "Well," says he, "from now on you will get one and a quarter time for over time." And so the next evening I marked my time, time and a half, and he came in the next morning and he brought my card in and he says, "I told you to mark your time time and a quarter," and I said, "I know you did." "I am not going to do it; if you want this time-card changed you will change it yourself." He says, "If you don't want to work for time and a quarter, you can quit." I said, "All right, I will quit." I had already talked to the other men in the shop about it, and they seemed to think that it was all right, they would abide, at least they didn't raise a voice against it. I was the only one that made any kick. I quit and I went home. I then went to the office of the company in the Hardware Building and found Mr. Lyman Stewart and I told him the trouble.

Under Mr. Stewart's orders I again went to work. He told me to go back to work and I did so. Double asked when I went back to the shop, "What did you come for?" I told him I had come back to work, and he said, "You won't do anything of the kind." I said I would. I told him Mr. Stewart told me to go and I had talked to him and he had talked to Mr. Double. Mr. Double came into the shop to me, and he sat on the bench where I was working for quite awhile before he said anything. Then he said, "Mr. Jones, I have an apology to make, to you." He said, "You

(Testimony of Fred W. Jones.)

and I haven't been getting along very well." He says, "It has been a mistake"; and he said, "From now on we'll be good friends; we will assist one another." [834] He says, "You can help me and I can help you." And he says, "We will be friends." I says, "All right, Mr. Double." I said, "I am willing to do anything to help you, help the concern along." That ended our grievance. We never had no more trouble after that. This occurrence was some time prior to the time the first underreamer was made in that shop. It was quite awhile before that time. I don't believe Mr. Buffington was ever at work in the Union Oil Tool Company's shop at Santa Paula while I was there. I have seen him at work in that shop later on.

I had a talk with Mr. Terriberry along last September or October—some time along there. At that time Mr. Terriberry told me that the best that he could remember, he was in Los Angeles, working for the rolling mills at the time I got up that underreamer, and that he could not help me out any. He had quite a long talk, but it was on other matters mostly.

I have heard Mr. Buffington's testimony this morning.

Testimony of Chas. A. Buffington, for Defendant.
(Recalled).

CHAS. A. BUFFINGTON, recalled on behalf of defendant, testifies as follows:

Mr. Jones called on me out at Sherman Junction

(Testimony of Chas. A. Buffington.)

in the Regan Oil Tool Company's shop. He first asked me if I remembered when I came to work for the Union Oil Tool Company at Santa Paula. I told him I did. He asked me if he was working there at that time, and I said he was not.

He asked me if I had done any work on that reamer and I told him that I had. He wanted to know if it was commonly known in and around the place that he was interested in that reamer. I told him it was not. He says to me, "If anybody should ask you, why, you tell them I was." I then reported that to Mr. Lyon. They then attempted to get me to sign an affidavit that Mr. Jones was the inventor of that reamer. [835]

**Testimony of Fred W. Jones, for Defendant
(Recalled).**

When I went out to see Mr. Buffington, to the best of my recollection, I first approached on whether he remembered about the time this reamer was being in the course of construction, or whether it was completed, or whether it was under construction when he came there. He stated that he thought it was about completed, but they were putting it together and he only remembered of only doing one job on the reamer, and that he had already stated. I did not ask Buffington whether or not I had worked at the Union Oil Tool Company's shop in summer of 1901. He said he would give an affidavit as to what he knew about the affair, and I took a stenographer out and he took the affidavit down of Mr. Buffington, and then Mr.

(Testimony of Fred W. Jones.)

Buffington, as I understand it, refused to sign this affidavit. There was a reporter present during this conversation. He took it all down.

**Testimony of J. B. Shaw, Witness Called on Behalf
of Defendants.**

Mr. Shaw testifies as follows:

My name is J. B. Shaw; age, 52; salesman. Have been in the machinery business about sixteen or seventeen years. During 1901 was with the Pacific Coast Manufacturing Company. Business was in Los Angeles. At one time that firm sold a lathe to Mr. Skinner of Santa Paula. I don't remember the exact date, but I know it was about when I had been there two years. I have no knowledge of the particular date of the transaction. I went with them in 1899. We sold Skinner a Flather lathe and I think a drill press. I remember that distinctly, because we sold two or three only of that make. I can refresh my memory as to the date from old letter press copy book. The letter to which I was intending to refer was a letter with reference to a shipment, to the purchase of the lathe and the shipment of the lathe from Los Angeles to Santa Paula. It was a letter given to Skinner. It was contained in the letter book of the Pacific Coast Manufacturing Company. I [836] know that that was the letter-book of that company at that time.

I did not copy the letter. I know that book contains letters that I dictated.

I saw the packet containing the lathe. My recol-

(Testimony of J. B. Shaw.)

lection is it was completely boxed. To my knowledge it was shipped to Skinner. It is my knowledge that it came from Flather & Company, New Hampshire.

Testimony of James A. Haskett, for Defendant.

Testimony of JAMES A. HASKETT, witness on behalf of defendant, testifies as follows:

My name is James Haskett; I deal in street improvement bonds. I have been in the machinery business, and was, during the years of 1900 and 1901. I was vice-president and general manager of the Pacific Coast Manufacturing Company. That was in Los Angeles. I was general manager of the concern and in close touch with the business. I have a recollection of a transaction with George L. Skinner of Santa Paula. Will say that myself and associates bought the firm of C. B. Booth Company in December, of 1900. This transaction with Skinner I think perhaps in December of 1900, or January of 1901. The lathe was shipped by the Flather people on February 7, 1901. It was my recollection that that lathe was shipped on March 20th or 23 of 1901, from Los Angeles to Santa Paula.

I have a letter-book in which is a copy of the letter. From my own recollection I do not remember of having seen the lathe. I don't remember of ever having seen the lathe. There was considerable delay in getting this shipment from the factory. It was a large engine lathe, I think 26" x 16 feet, and the factory did not make as prompt shipment as they had led us to believe, when the order was given, that they would. This was the means of considerable cor-

(Testimony of James A. Haskett.)

respondence. I remember that the lathe was shipped, reached Los Angeles, was reshipped to George L. Skinner at Santa Paula. We paid for the lathe and he paid us. Prompt payment was [837] made by Mr. Skinner shortly after receipt by Mr. Skinner at Santa Paula. I would say that payment was made within thirty days from the receipt of the lathe by Mr. Skinner at Santa Paula. There was no congestion in freight between Los Angeles and Santa Paula. I think there was no delay from Los Angeles to Santa Paula.

**Testimony of E. C. Wilson, Called on Behalf of
Defendant.**

Concerning Mr. Youngken's testimony to the effect that he worked with the Union Oil Tool Company and its successor, the Union Tool Company, from the time he first testified about, including the year 1901, I will say that Mr. Youngken was employed by the Webster Iron Works of Bakersfield, California, and was also employed by the Bakersfield Iron Works in Bakersfield, to the best of my recollection, during the time that I was manager of that shop. I think that was during 1904 or '05.

I do not remember the exact length of time he was employed there.

I made no offer to Mr. Jones for any testimony or for any of his interests. I told him that if he should testify for us of course he would be entitled to witness fees and that he would be entitled to his transportation charges or expenses.

(Testimony of E. C. Wilson.)

I went to see Mr. Jones at McFarland about June or July of 1915. I had conversation with him then in regard to the reamer matters. Was also present the day he gave his deposition in A-4 Bakersfield. I do not remember that I wired him to meet us in Bakersfield that morning. I will not be positive. We may have wired. I did have a talk with him—not a long talk with him before his deposition that morning. I talked with him just a few minutes.

It was at my instigation that Mr. Jones came to Los Angeles [838] to take up the underreamer matters. No agreement to pay him anything except his witness fees and expenses. I suppose his total expenses were probably \$150. Don't remember how much we paid him for the expenses of his second visit to Los Angeles. Have probably paid him \$20 or \$25 for his expenses up to date on this trip. I think we sent Mr. Jones to Mr. Eckenhooffer and Mr. Chatterton to try and purchase their interests in the Double patent. He was representing us to obtain information.

As to the expenses of a man taking care of the ranch there were no arrangements made at all. I understand that their son is staying at the ranch and taking care of the ranch, so I have just been informed in the last day or so. We have paid Jones a small amount for his time while he was down here gathering up data in addition to his actual expenses. [839]

STIPULATION.

It is stipulated that the foregoing may be approved by the Court as a condensed statement of the testi-

mony and proceedings during the taking of testimony, under Rule 75, for the purposes of defendant's appeal.

FREDERICK S. LYON,
Solicitor for Complainants.

RAYMOND IVES BLAKESLEE,
Solicitor for Defendant.

Approved:

BLEDSON,
District Judge.

[Endorsed]: C. C. No. 1540. U. S. District Court, Southern District of California, Southern Division. Union Tool Co. vs. Wilson & Willard Mfg. Co. Condensed Statement on Appeal. Filed Apr. 27, 1917. Wm. M. Van Dyke, Clerk. By R. S. Zimmerman, Deputy Clerk. [840]

In the United States District Court, Southern District of California, Southern Division.

IN EQUITY—CIR. CT. No. 1540.

UNION TOOL COMPANY et al.,
Complainants,

vs.

WILSON & WILLARD MANUFACTURING
COMPANY,

Defendant.

Order for Transmission of Exhibits to United States Circuit Court of Appeals for the Ninth Circuit.

It appearing that complainant-appellant in this cause has requested such action, and good cause appearing therefor,—

IT IS ORDERED, that all of the original exhibits forming part of the evidence in this cause, being because of their nature necessary to inspection by the United States Circuit Court of Appeals for the Ninth Circuit, and by the Supreme Court of the United States, if said cause is appealed thereto, may be sent up as original exhibits instead of making copies or duplicates thereof, in addition to the transcript of the record, in accordance with subdivision 4 of Rule 14 of the Rules of the United States Circuit Court of Appeals, for the Ninth Circuit, and subdivision 4 of Rule 8 of the Rules of the Supreme Court of the United States; the said exhibits to be delivered to the clerk of the United States Circuit Court of Appeals for the Ninth Circuit, to be returned to the files of the cause in this Court, upon the final determination of the appeal herein by the [841] United States Circuit Court of Appeals for the Ninth Circuit or by the Supreme Court of the United States, if appealed thereto.

Dated Los Angeles, California, July 26, 1916.

BLEDSON,
Judge. [842]

[Endorsed]: In Equity—Cir. Ct. C. C. No. 1540. United States District Court, Southern District of California, Southern Division. Union Tool Co. et al., Complainants, vs. Wilson & Willard Mfg. Co., Defendant. Order for Transmission of Exhibits to United States Circuit Court of Appeals, etc. Filed July 27, 1916. Wm. M. Van Dyke, Clerk. By Chas. N. Williams, Deputy Clerk. Raymond Ives Blakes-

lee, 726-30 California Building, Los Angeles, Cal.,
Solicitor for Defendant. [843]

*In the United States District Court, Southern Dis-
trict of California, Southern Division.*

IN EQUITY—CIR. CT. No. 1540.

UNION TOOL COMPANY et al.,
Complainants,

vs.

WILSON & WILLARD MANUFACTURING
COMPANY,
Defendant.

Petition for Order Allowing Appeal.

Wilson & Willard Manufacturing Company, defendant in the above-entitled cause, conceiving itself aggrieved by the Interlocutory Order and Decree filed and entered on the 1st day of July, 1916, in pursuance of the Memorandum Decision filed June 19, 1916, in the above-entitled cause, whereby it was ordered, adjudged and decreed that the complainants' letters patent are good and valid in law, particularly as to claims 1, 2, 6, 7 and 8 thereof; that defendant has infringed the same, and particularly upon said ant has infringed the same, and particuary upon said claims 1, 2, 6, 7 and 8 thereof; and that a perpetual injunction issue directed to said defendant, its officers, attorneys, directors, agents, servants, workmen and associates, enjoining them, and each and every of them, from manufacturing or causing to be manufactured, using or causing to be used, selling or causing to be sold, either directly or indirectly, any

underreamer or underreamers like or embodying the construction or interrelation of parts of either "Complainants' Exhibit Wilson Reamer," "Complainants' Exhibit Wilson Reamer No. 2," or the Wilson underreamer with the two-piece device, or the underreamer set forth or described in Letters Patent No. 827,595, dated July 31, 1906, to Elihu C. [844] Wilson, and from manufacturing or causing to be manufactured, selling or causing to be sold, using or causing to be used, either directly or indirectly, any part or parts thereof capable of being combined or used as a part of any underreamer or device in infringement of said letters patent, that is, of claims 1, 2, 6, 7 and 8 thereof in any manner whatsoever, or from manufacturing or causing to be manufactured, using or causing to be used, selling or causing to be sold, either directly or indirectly, any combination of parts capable of being assembled together or used in infringement of said letters patent that is of claims 1, 2, 6, 7 and 8 thereof,—together with costs and disbursements of this suit to the complainants, and awarding other relief,—now comes Raymond Ives Blakeslee, Esq., solicitor for defendant, and petitions said Court for an order allowing defendant, Wilson & Willard Manufacturing Company, to prosecute an appeal from said interlocutory order and decree and the decision of the Court thereupon, and from the whole thereof, to the Honorable, The United States Circuit Court of Appeals for the Ninth Circuit, for the reasons specified in the Assignment of Errors which is filed herewith, under and according to the laws of the United States in that behalf made

and provided; and also that an order be made fixing the amount of security which defendant shall give and furnish upon such appeal; and that a citation issue as provided by law, and that a certified transcript of the records, proceedings and papers upon which said decree was based be forthwith transmitted to the United States Circuit Court of Appeals for the Ninth Circuit, together with the exhibits on file in this case, in accordance with the Rules in Equity promulgated by the Supreme Court of the United States and the statutes made and provided. [845]

And your petitioner will ever pray.

RAYMOND IVES BLAKESLEE,

Solicitor for Defendant. [846]

[Endorsed]: In Equity—Cir. Ct. No. 1540. United States District Court, Southern District of California, Southern Division. Union Tool Co. et al., Complainants, vs. Wilson & Willard Mfg. Co., Defendant. Petition for Order Allowing Appeal. Filed Jul. 21, 1916. Wm. M. Van Dyke, Clerk. By Chas. N. Williams, Deputy Clerk. Raymond Ives Blakeslee, 728-30 California Building, Los Angeles, Cal., Solicitor for Defendant. [847]

In the United States District Court, Southern District of California, Southern Division.

IN EQUITY—CIR. CT. No. 1540.

UNION TOOL COMPANY et al.,

Complainants,

vs.

WILSON & WILLARD MANUFACTURING
COMPANY,

Defendant.

Order Allowing Appeal.

In the above-entitled cause the defendant having filed its petition for an order allowing an appeal from the order of this Court made and entered July 1, 1916, together with Assignment of Errors;

Now, upon motion of Raymond Ives Blakeslee, Esq., solicitor for defendant, IT IS ORDERED that said appeal be, and hereby is, allowed to defendant, to the United States Circuit Court of Appeals for the Ninth Circuit, from the said order or decree made and entered by this Court in this cause on July 1, 1916, that defendant be enjoined and restrained from infringement of those certain letters patent No. 734,833, of complainants specified in said order, and further awarding costs and other relief to complainants, and that the amount of defendant's bond on said appeal be, and the same is hereby fixed at the sum of two hundred fifty dollars (\$250).

IT IS FURTHER ORDERED, that upon the filing of such security a certified transcript of the records and proceedings herein be forthwith trans-

mitted to said United States Circuit Court of Appeals for the Ninth Circuit, in accordance with the [848] Rules in Equity by the Supreme Court of the United States promulgated, and in accordance with the statutes made and provided, together with the exhibits on file in this case or duly certified copies thereof.

Dated July 21, 1916.

BLEDSON,
Judge. [849]

[Endorsed]: In Equity—Cir. Ct. No. 1540. United States District Court, Southern District of California, Southern Division. Union Tool Co. et al., Complainants, vs. Wilson & Willard Mfg. Co., Defendant. Order Allowing Appeal. Filed Jul. 22, 1916. Wm. M. Van Dyke, Clerk. By R. S. Zimmerman, Deputy Clerk. Raymond Ives Blakeslee, 728-30 California Building, Los Angeles, Cal., Solicitor for Defendant. [850]

In the United States District Court, Southern District of California, Southern Division.

IN EQUITY—CIR. CT. No. 1540.

UNION TOOL COMPANY et al.,
Complainants,

vs.

WILSON & WILLARD MANUFACTURING
COMPANY,

Defendant.

Assignment of Errors.

Comes now the defendant above named and specifies and assigns the following as the errors upon which it will rely upon its appeal to United States Circuit Court of Appeals for the Ninth Circuit, from the decree or order of this Court of July 1, 1916:

I.

That the District Court of the United States for the Ninth Circuit, Southern District of California, Southern Division, erred in entering any decree in favor of complainants.

II.

That said Court erred in finding and decreeing that the letters patent sued on are good and valid in law.

III.

That said Court erred in finding and decreeing that the letters patent sued on, even if good and valid in law, are infringed.

IV.

That the Court erred in finding and decreeing that Edward Double was the original, first, true and sole inventor [851] of the alleged invention disclosed and claimed in and by the letters patent sued on.

V.

That the said Court erred in not finding that Frederick W. Jones, then of Santa Paula, County of Ventura, California, was the original, first, true and sole and independent inventor of the invention of the letters patent sued on; or in not finding, alternatively,

that said Edward Double and said Frederick W. Jones were the joint inventors of the invention of the letters patent sued on; or alternatively, in not finding that one Jacob S. Brown, then of Los Angeles, County of Los Angeles, and State of California, was the original, first, true and sole inventor of the invention of the letters patent sued on.

VI.

That said Court erred in not finding that the letters patent sued on are anticipated by or to be narrowly construed in view of the so-called Canadian underreamer.

VII.

That the Court erred in not finding that the letters patent sued on are anticipated by or to be narrowly construed in view of the so-called O'Donnell and Willard device.

VIII.

That said Court erred in not finding that the presumption of validity of the letters patent sued on was destroyed by the failure of the Patent Office to declare an interference pursuant to section 4904, U. S. R. S., as between the application for the letters patent sued on and the co-pending application for letters patent for the O'Donnell and Willard patent No. 762,435.

IX.

That the Court erred in not finding that the presumption of the validity of letters patent sued on is destroyed because of the failure of the Patent Office to declare an interference [852] proceeding pursuant to section 4904, U. S. R. S., between the appli-

cation for the letters patent sued on and the co-pending application for letters patent No. 687,296 to Brown.

X.

That the Court erred in not finding that a model of the so-called Brown reamer, being before and known by said Edward Double prior to the time of his alleged invention of the invention of the letters patent sued on, said letters patent sued on are to be narrowly construed as to any possible invention therein contained.

XI.

That the Court erred in not finding that as to any possible breadth or scope or importance the invention of the letters patent sued on, same is reflected and claimed and described and disclosed in the O'Donnell and Willard patent No. 762,435, so that the applicants for said letters patent, having filed their application prior to the application for the letters patent sued on, are to be presumed to be the first, original, and joint inventors of any such inventive matter of any possible scope or importance claimed in and by the letters patent sued on.

XII.

That the Court erred in not finding that the letters patent sued on are anticipated by or are to be narrowly construed in view of the so-called Jones' round-nosed reamer.

XIII.

That the Court erred in not finding that said Jones' round-nosed reamer being before or known by said Edward Double prior to the time of his alleged in-

vention of the invention of the letters patent sued on, said Edward Double surreptitiously applied for the letters patent sued on and was not the original [853] first, sole and independent inventor of the alleged invention of the letters patent sued on, and wrongfully obtained said letters patent sued on.

XIV.

That the Court erred in not finding that the so-called Brown reamer model having been before and known by said Edward Double prior to the time of his alleged invention of the invention of the letters patent sued on, said Edward Double surreptitiously applied for the letters patent sued on and wrongfully obtained the letters patent sued on.

XV.

That the Court erred in not finding that the Swan reamer and patent of Swan letters patent No. 683,352 both anticipate the letters patent sued on, or that in view thereof the letters patent sued on must be narrowly construed.

XVI.

That the Court erred in not finding that said Frederick W. Jones actually invented, produced, made the first drawings of, and to an extent superintended the construction of, the first underreamer or underreamers produced containing and embodying in part or in whole the invention of the letters patent sued on, and that Edward Double obtained all of his knowledge of said invention from the same and from said Frederick W. Jones.

XVII.

That the Court erred in not finding that because

of the many patents and devices recited, and many other patents and devices, the letters patent sued on are entirely and wholly anticipated or are to be so narrowly construed that the devices of the defendant complained of cannot infringe said letters patent.

XVIII.

That the Court erred in not finding that the letters patent [854] sued on are wholly and totally void and invalid and of no effect whatsoever.

XIX.

That the Court erred in not finding that the said Edward Double in his said application for the letters patent sued on so voluntarily limited his claims that the same cannot receive any broad or substantially comprehensive interpretation whatsoever, but must on the contrary be most narrowly construed, so as not to be infringed by the devices of the defendant complained of.

XX.

That the Court erred in not finding that the devices of the defendant embody a radically different and important invention clearly distinguished from the invention of the letters patent sued on, defendant's president having received letters patent under which such reamers were made and which are numbered 827,595.

XXI.

That the Court erred in not finding as a matter of law that the defendant has and at all times since the date of issuance thereof has had, a constructive license to use any material invention described, dis-

closed and claimed in the letters patent sued on, and likewise claimed in letters patent No. 762,435 issued to said O'Donnell and Willard.

XXII.

That the Court erred in not finding that the complainants' reamer failed to thoroughly and extensively take the field or satisfy drillers and users until after it had been altered and changed to embody important features of the said invention of said letters patent No. 827,595 to Elihu C. Wilson, president of defendant corporation. [855]

XXIII.

That the Court erred in not finding that the said invention of said letters patent to Wilson No. 827,595 constituted "the last step in the art" and made underreaming in California and other fields a true success, and effectively and exclusively took such field so as to crowd out and displace somewhat the earlier underreamers of the letters patent sued on, being a stronger, safer, more reliable, longer-lived, more easily assembled, and generally more satisfactory underreamer.

XXIV.

That the Court erred in not finding that claims 1, 2, 6, 7 and 8 of the letters patent sued on are as specifically limited in terms as the remaining claims of the letters patent sued on, and equally and as plainly and clearly not infringed by the devices of the defendant complained of.

XXV.

That the Court erred in finding that extensive use of the alleged invention of the patent in suit with the

presumption arising from the grant of the patent is sufficient to dissolve any doubt in favor of the validity of the patent.

XXVI.

That the Court erred in finding said Frederick W. Jones to be an employee of National Supply Company.

XXVII.

That the Court erred in finding that the Mills-Double interference was an interference contest involving the Double underreamer, if such Double underreamer was to be understood to be the specific reamer of the alleged invention of the letters patent sued on.

XXVIII.

That the Court erred in finding that the testimony of the [856] said Frederick W. Jones is to be so discredited as to leave no warrant for overthrowing the presumption of regularity of the issuance of the patent in suit.

XXIX.

That the Court erred in finding that the main question in this cause is what range of equivalents, if any, complainants are entitled, under the patent in suit, to be protected against.

XXX.

That the Court erred in finding that the complainants are entitled to a fair range of equivalents with respect to the patent in suit.

XXXI.

That the Court erred in finding that the tilting means adopted for the collapsion and expansion of

the cutters of the letters patent sued on and the combining of the same with inter-related dovetails on the cutters and ways of the body extension, were features either chiefly novel or novel at all in the alleged invention of the letters patent sued on.

XXXII.

That the Court erred in finding that any distinction exists between underreamer cutter actions in which there is a sliding of the cutter on the key and a tilting of the cutter on the key, inasmuch as both such actions, rather than a rocking or swinging action like that of the defendant's device, occur in the underreamer of the letters patent sued on, the rocking or swinging action of defendant's devices finding its counterpart in the rocking or swinging action of the so-called Brown reamer and patent, and the tilting action finding its counterpart in the so-called O'Donnell and Willard reamer and patent and being properly described as action tending to an upending in contradistinction from the more properly described [857] pendulum action of the cutters of the defendant's devices and the so-called Brown reamer and patent cutters.

XXXIII.

That the Court erred in not finding that there is a distinction between the release of the cutters immediately permitted in the commencement of col-lapsion in defendant's devices, and the delayed col-lapsion produced in the devices of the letters patent sued on due to the parallel faces of the hollow-slotted extension thereof.

XXXIV.

That the *Court* in finding that in the letters patent sued on stronger body construction is permitted than in the so-called O'Donnell and Willard device.

XXXV.

That the Court erred in finding that there is no spreading bearing in the so-called Jones' round-nosed reamer between the cutters to assist in the expansion and collapsion of the cutters.

XXXVI.

That the Court erred in finding that the difference in mode of operation between the so-called Jones' round-nosed and said Double reamer of the patent sued on, renders it unnecessary to consider whether the Jones' round-nosed reamer preceded the said Edward Double invention and whether said Edward Double was familiar with it.

XXXVII.

That the Court erred in finding that the defendant's devices infringe the letters patent sued on.

XXXVIII.

That the Court erred in finding defendant's devices to infringe the letters patent sued on, while finding that the [858] difference in mode of operation between the so-called O'Donnell and Willard underreamer and the underreamer of the letters patent sued on was such as to render it unnecessary to consider whether there should have been an interference proceeding in the Patent Office relating to the applications for said O'Donnell and Willard patent and the letters patent sued on.

XXXIX.

That the Court erred in finding that the defendant's devices infringe the letters patent sued on, while finding that the essential difference between the so-called earlier Brown patent reamer and the reamer of the letters patent sued on was the suspension means for the cutters, inasmuch as the defendant's *devides* do not use the suspension means of the letters patent sued on, and it has been conceded in this cause that all of the parts of the reamers of the letters patent sued on themselves were old prior to the alleged invention of the invention of the letters patent sued on, and in view of the withdrawal by complainants of the charge of infringement as to claims 3, 4 and 5 of the letters patent sued on.

XL.

That the Court erred in finding that the 1900 Oil Well Supply Company catalogue cut of the so-called Canadian reamer is not sufficient publication to establish anticipation.

XLI.

That the Court erred in not finding that in effect the cutters of the so-called Canadian underreamer are suspended from a spring-actuated rod in the body of the underreamer.

XLII.

That particularly in view of the so-called Jones' round-nosed reamer the Court erred in finding that none of the underreamers of the prior art combine cutters tilting over the lower end of the underreamer body with shanks having dovetails so inter-related [859] to dovetail ways upon the body of the under-

1028 *Wilson & Willard Manufacturing Company*
reamer as to afford inner, outer and lateral bearings
when in working position.

XLIII.

That the Court erred in finding that the cutters of the so-called Brown device or patent might fail to be jointly operated to collapse the same when withdrawing the reamer from working position, inasmuch as a sufficient amount of elevation would of necessity collapse the cutters.

XLIV.

That the Court erred in finding that the letters patent sued on cover inter-related dovetails on the cutter shanks and ways therefor on the body of the extension, with the means by which the tilting action of the cutters over the lower end of the body was accomplished, in not broad or other than most narrow significance and in combination with specific details, inasmuch as the letters patent sued on do not contain any claim for such features independent of said limitations, which limitations *in toto* are not found embodied in defendant's reamer, and it having been conceded by complainants in this cause that all parts of the underreamer of the letters patent sued on were old at the time of the alleged invention thereof by said Edward Double.

XLV.

That the Court erred in finding that breadth or scope resides in the claims of the letters patent sued on because of the inclusion of a plurality of elements therein, or due to any attempted combinative reading of one claim of said patent with another, the claims of the letters patent being in effect for sepa-

rate inventions within the law.

XLVI.

That the Court erred in finding that the opposite bearing [860] faces 9 upon the prongs of the defendant's devices could be made parallel without affecting materially the functions discharged by them.

XLVII.

That the Court erred in not finding that said Edward Double, having elected to use and specify the well-known hollow slotted extension type of under-reamer and to have claimed same in the letters patent sued on, could not be heard to say that the letters patent sued on cover defendant's devices.

XLVIII.

That the Court erred in finding that if a web were placed between the prongs of the defendant's devices such formation would become hollow and slotted, unless such hollow and slot were deliberately provided in such web.

XLIX.

That the Court erred in finding that the lateral shoulders on the cutters of defendant's devices are the equivalents of the inwardly directed shoulders on the cutters of the devices of the letters patent sued on.

L.

That the Court erred in not finding that the prior so-called O'Donnell and Willard reamer device is provided with enlarged key-seats in the cutters in full anticipation of the corresponding feature of the letters patent sued on.

LI.

That the Court erred in not finding that the changes and variations in the defendant's devices were for definite objects and purposes distinguished from the objects, purposes and features of construction of the devices of the letters patent sued on. [861]

LII.

That the Court erred in finding that defendant's devices or any of the same are or is a mechanical equivalent in part or in whole of the devices of the letters patent sued on and therefore infringe the latter.

LIII.

That the Court erred in granting any injunctive relief whatsoever to complainants or a decree to complainants, or allowing costs to complainants, or allowing any relief or recovery whatsoever to complainants.

LIV.

That said Court erred in not finding and decreeing that the Bill of Complaint be dismissed and this cause be dismissed for want of equity.

LV.

That the Court erred in not finding that said Edward Double surreptitiously applied for the letters patent sued on and was not the original, first, sole and independent inventor of the alleged invention of the letters patent sued on and wrongfully obtained said letters patent sued on.

In order that the foregoing Assignment of Errors may be made of record, the defendant presents the

same to the Court and petitions that disposition may be made thereof in accordance with the laws of the United States thereunto provided.

WHEREFORE, the defendant prays that the said decree and order of this Court made and entered on July 1st, 1916, enjoining and restraining defendant, be reversed, in part and in whole, and that the Bill of Complaint herein be ordered dismissed, and that the restraining order herein be ordered vacated, and that the United States District Court for the Southern District of California, Southern Division, be directed to enter [862] an order, accordingly, and setting aside in entirety the order and decree of July 1st, 1916, with costs to defendant.

Respectfully submitted,

RAYMOND IVES BLAKESLEE,

Solicitor and of Counsel for Defendant. [863]

[Endorsed]: In Equity—Cir. Ct. No. 1540. United States District Court, Southern District of California, Southern Division. Union Tool Co. et al., Complainants, vs. Wilson & Willard Mfg. Co., Defendant. Assignment of Errors. Filed Jul. 19, 1916. Wm. M. Van Dyke, Clerk. By R. S. Zimmerman, Deputy Clerk. Raymond Ives Blakeslee, 728-30 California Building, Los Angeles, Cal., Solicitor for Defendant. [864]

[Documentary Internal Revenue Stamp. 4.
Cancelled Jul. 27, 1916.]

[Documentary Internal Revenue Stamp. 1.
Cancelled Jul. 27, 1916.]

*In the United States District Court, Southern Dis-
trict of California, Southern Division.*

IN EQUITY—CIR. CT. No. 1540.

UNION TOOL COMPANY et al.,

Complainants,

vs.

WILSON & WILLARD MANUFACTURING
COMPANY,

Defendant.

Bond on Appeal.

KNOW ALL MEN BY THESE PRESENTS:
That Maryland Casualty Company, a corporation
organized and existing under the laws of the State
of Maryland, and duly licensed to transact business
in the State of California, is held and firmly bound
unto Union Tool Company, Edward Double, Rosa
Eichenhofer, as administratrix of the estate of
Friedrich Eichenhofer, deceased, and George L.
Chadderdon, complainants in the above-entitled suit,
in the penal sum of Two Hundred Fifty Dollars
(\$250), to be paid to the said Union Tool Company,
Edward Double, Rose Eichenhofer, as administra-
trix of the estate of Friedrich Eichenhofer, deceased,
and George L. Chadderdon, their heirs, executors,
administrators, successors and assigns, which pay-
ment well and truly to be made the Maryland Casu-

alty Company binds itself, its successors and assigns, firmly by these presents.

Sealed with the corporate seal and dated this 27th day of July, 1916.

The condition of the above obligation is such that whereas the said defendant, Wilson & Willard Manufacturing Company, of the above-entitled suit, is about to take an appeal [865] to the United States Circuit Court of Appeals for the Ninth Circuit to reverse an order or decree made, rendered and entered on the 1st day of July, 1916, by the District Court of the United States, for the Southern District of California, Southern Division, in the above-entitled cause by which the said defendant, Wilson & Willard Manufacturing Company, was enjoined and restrained from infringement of United States Letters Patent No. 734,833, and were awarded other relief, with costs to said complainants:

NOW, THEREFORE, the condition of the above obligation is such that if said Wilson & Willard Manufacturing Company shall prosecute its said appeal to effect and answer all damages and costs if they shall fail to make good their appeal, then this obligation shall be void; otherwise to remain in full force and effect.

IN WITNESS WHEREOF, the seal and signature of said principal is hereunto affixed and the corporate name of said surety is hereunto affixed and attested by its duly authorized attorneys in fact, at

1034 *Wilson & Willard Manufacturing Company*

Los Angeles, California, this 27th day of July, 1916.

MARYLAND CASUALTY COMPANY,

[Seal of Maryland Casualty Company.]

By J. L. VAN NORMAN,
Attorney in Fact.

[Seal] And by V. J. NORTH,
Attorney in Fact,

WILSON & WILLARD MANUFACTUR-
ING COMPANY,

Per E. C. WILSON,
Pres.

State of California,

County of Los Angeles,—ss.

On this 27th day of July, in the year one thousand nine hundred and sixteen A. D., before me, L. B. Belcher, a notary public in and for said county and State, residing therein, duly commissioned and sworn, personally appeared J. L. Van Norman and [866] V. J. North, known to me to be the duly authorized attorneys in fact of the Maryland Casualty Company, and the same persons whose names are subscribed to the within instrument as attorneys in fact of said company, and the said J. L. Van Norman and V. J. North duly acknowledged to me that they subscribed the name of the said Maryland Casualty Company thereto as principal and their own names as attorneys in fact.

IN WITNESS WHEREOF, I have hereunto set my hand and affixed my official seal the day and year

in this certificate first above written.

[Notarial Seal]

L. B. BELCHER,

Notary Public in and for the County of Los Angeles,
State of California.

(OK-F. S. L.) [867]

[Endorsed]: In Equity—Cir. Ct. No. 1540.
United States District Court, Southern District of
California, Southern Division. Union Tool Co. et
al., Complainants, vs. Wilson & Willard Mfg. Co.,
Defendant. Bond on Appeal. Approved 7/28/16.
Trippet, Judge. Filed Jul. 28, 1916. Wm. M.
Van Dyke, Clerk. By Leslie S. Colyer, Deputy
Clerk. Approved Sept. 7, 1916. Bledsoe, Judge.
Ok. as to form, surety and signatures. Frederick
S. Lyon, Solr. for Complainants. Raymond Ives
Blakeslee, 728-30 California Building, Los Angeles,
Cal., Solicitor for Defendant. [868]

*In the United States District Court, Southern Dis-
trict of California, Southern Division.*

IN EQUITY—CIR. CT. No. 1540.

UNION TOOL COMPANY et al.,

Complainants,

vs.

WILSON & WILLARD MANUFACTURING
COMPANY,

Defendant.

Affidavit of Service.

State of California,

County of Los Angeles,—ss.

Alfred H. Daehler, being duly sworn according

to law, says: That he is a patent solicitor and assistant in the office of Raymond Ives Blakeslee, solicitor and of counsel for defendant-appellant herein; that he is upwards of the age of twenty-one years and a citizen of the United States; that he served a true copy of the within and annexed paper upon Frederick S. Lyon, solicitor and of counsel for complainants-appellees herein, at the office of said Lyon, in the Merchants Trust Building, South Broadway, Los Angeles, California, at the hour of — o'clock — M., this — day of September, 1916, by handing to said Lyon a true copy of the within and annexed paper and at same time exhibiting to said Lyon the original within and annexed paper.

Subscribed and sworn to before me this — day of September, 1916.

Notary Public in and for the County of Los Angeles,
State of California. [869]

In the United States District Court, Southern District of California, Southern Division.

IN EQUITY—CIR. CT. No. 1540.

UNION TOOL COMPANY et al.,

Complainants,

vs.

WILSON & WILLARD MANUFACTURING
COMPANY,

Defendant.

Praecept Under Rule 75.

To the Clerk of the Court:

You will please incorporate into the transcript on appeal from this Court to the Circuit Court of Appeals, on order allowing appeal on behalf of defendant, made and entered July 21, 1916, the following portions of the record of this cause in equity, to wit:

The testimony and record and proceedings in connection therewith taken and had in this cause, in narrative and condensed form, as filed herewith.

The Bill of Complaint stating the same cause of action herein and which was dismissed on motion of defendant prior to the filing of the bill of complaint herein.

The Demurrer to said Bill of Complaint.

The Answer to said Bill of Complaint.

The Motion to Dismiss said Bill of Complaint.

The Bill of Complaint herein.

The Answer, the Amended Answer and the Amendments to the Answer of defendant herein.

The Motion for Leave to take testimony in open Court therein.

The Assignment of Errors filed herein. [870]

The Petition for Order Allowing Appeal herein.

The Order Allowing Appeal herein, signed by Judge Bledsoe.

The Citation on Appeal herein.

The names and addresses of the solicitors and counsel for the parties herein.

The Subpoena Ad Respondendum.

All of the original exhibits herein.

The Court Order as to withdrawal and transfer to the Circuit Court of Appeals for the Ninth Circuit of all exhibits herein.

The Bond on Appeal.

This Praecipe.

The Opinion of the District Judge on file herein; and,

The Decree herein.

Very respectfully,

RAYMOND IVES BLAKESLEE,

Solicitor and of Counsel for Defendant-Appellant.

[871]

[Endorsed]: In Equity—Cir. Ct. No. 1540. United States District Court, Southern District of California, Southern Division. Union Tool Company et al., Complainants, vs. Wilson & Willard Mfg. Co., Defendant. Praecipe Under Rule 75. Received a copy of within this 5th day of Sept., 1916. Frederick S. Lyon, Solr. for Compt. Raymond Ives Blakeslee, 728-30 California Building, Los Angeles, Cal., Solicitor for Defendant. Filed Sep. 5, 1916. Wm. M. Van Dyke, Clerk. By Leslie S. Colyer, Deputy Clerk. [872]

In the District Court of the United States of America, in and for the Southern District of California, Southern Division.

IN EQUITY—C. C. No. 1540.

UNION TOOL COMPANY, EDWARD DOUBLE,
ROSA EICHENHOFER, as Administratrix
of the Estate of FRIEDRICH EICHEN-
HOFER, Deceased, and GEORGE L.
CHADDERDON,

Complainants,

vs.

WILSON & WILLARD MANUFACTURING
COMPANY,

Defendant.

**Certificate of Clerk U. S. District Court to
Transcript of Record.**

I, Wm. M. Van Dyke, Clerk of the District Court of the United States of America, in and for the Southern District of California, do hereby certify the foregoing Eight hundred seventy-two (872) typewritten pages, numbered from 1 to 872, inclusive, and comprised in two (2) volumes, to be a full, true and correct copy of the Bill of Complaint, Subpoena, Amended Answer, Memorandum Decision, Interlocutory Decree, Notice That Complainants desire testimony to be taken orally, Condensed Statement of Evidence, Order for Transmission of Exhibits, Petition for Order Allowing Appeal, Order Allowing Appeal, Assignment of Errors, Bond on Appeal, and the Praeceptum under Rule 75, in the

above and therein entitled cause, and that the same together constitute the record in said cause as specified in the said Praecipe filed in my office on behalf of the Appellant by his Solicitor of Record.

I further certify that the cost of the foregoing [873] record is \$425, the amount whereof has been paid me by Wilson & Willard Manufacturing Company, the Appellant herein.

IN TESTIMONY WHEREOF, I have hereunto set my hand and affixed the seal of the District Court of the United States of America, in and for the Southern District of California, this 30th day of April, in the year of our Lord one thousand nine hundred and seventeen, and of our independence the one hundred and forty-first.

[Seal]

WM. M. VAN DYKE,

Clerk of the District Court of the United States of America, in and for the Southern District of California. [874]

[Endorsed]: No. 2996. United States Circuit Court of Appeals for the Ninth Circuit. Wilson & Willard Manufacturing Company, a Corporation, Appellant, vs. Union Tool Company, a Corporation, Edward Double, Rosa Eichenhofer, as Administratrix of the Estate of Friedrich Eichenhofer, Deceased, and George L. Chadderdon, Appellees. Transcript of Record. Upon Appeal from the

United States District Court for the Southern District of California, Southern Division.

Filed May 4, 1917.

F. D. MONCKTON,

Clerk of the United States Circuit Court of Appeals
for the Ninth Circuit.

By Paul P. O'Brien,
Deputy Clerk.

*In the United States Circuit Court of Appeals,
Ninth Judicial Circuit.*

WILSON & WILLARD MANUFACTURING
COMPANY,

Appellant,

vs.

UNION TOOL COMPANY et al.,

Appellees.

**Order Extending Time to January 1, 1917, to File
Record.**

Good cause appearing therefor,

IT IS HEREBY ORDERED, that the time heretofore allowed said appellant to docket said cause and to file the record thereof, with the clerk of the United States Circuit Court of Appeals for the Ninth Circuit, be and the same is hereby enlarged and extended to and including the 1st day of January, 1917.

Dated at Los Angeles, California, September 25, 1916.

BLEDSON,

U. S. District Judge, Southern District of California.

1042 *Wilson & Willard Manufacturing Company*

[Endorsed]: No. —. United States Circuit Court of Appeals, Ninth Circuit. Wilson & Willard Mfg. Co., Appellant, vs. Union Tool Co. et al., Appellees. Order Extending Time to Jan. 1, 1917, to File Record.

No. —. United States Circuit Court of Appeals for the Ninth Circuit. Order Under Rule 16 Enlarging Time to — to File Record Thereof and to Docket Case. Filed Oct. 2, 1916. F. D. Monckton, Clerk.

*In the United States Circuit Court of Appeals,
Ninth Judicial Circuit.*

WILSON & WILLARD MANUFACTURING
COMPANY,

Appellant,

vs.

UNION TOOL COMPANY et al.,

Appellees.

**Order Extending Time to February 1, 1917, to File
Record.**

Good cause appearing therefor,

IT IS HEREBY ORDERED, that the time heretofore allowed said appellant to docket said cause and to file the record thereof, with the clerk of the United States Circuit Court of Appeals for the Ninth Circuit, be and the same is hereby enlarged and extended to and including the first day of February, 1917.

Dated at Los Angeles, California, December 15,
1916.

BLEDSON,
U. S. District Judge, Southern District of California.

[Endorsed]: No. —. United States Circuit Court of Appeals, Ninth Judicial Circuit, Wilson & Willard Mfg. Co., Appellant, vs. Union Tool Co. et al., Appellees. Order Extending Time to Feb. 1, 1917, to File Record.

No. —. United States Circuit Court of Appeals for the Ninth Circuit. Order Under Rule 16 Enlarging Time to Feby. 1, 1917, to File Record Thereof and to Docket Case. Filed Dec. 18, 1916. F. D. Monckton, Clerk.

*In the United States Circuit Court of Appeals,
Ninth Judicial Circuit.*

WILSON & WILLARD MANUFACTURING
COMPANY,

Appellant,

vs.

UNION TOOL COMPANY et al.,

Appellees.

**Order Extending Time to April 1, 1917, to File
Record.**

Good cause appearing therefor, and it appearing from representations of counsel that the parties to this litigation are attempting to arrive at a settlement of the issues involved,—

IT IS HEREBY ORDERED, that the time here-

tofore allowed said appellant to docket said cause and to file the record thereof, with the clerk of the United States Circuit Court of Appeals for the Ninth Circuit, be and the same is hereby enlarged and extended to and including the 1st day of April, 1917.

Dated at Los Angeles, California, January 10th, 1917.

BLEDSON,

U. S. District Judge, Southern District of California.

[Endorsed]: No. —. United States Circuit Court of Appeals, Ninth Judicial Circuit. Wilson & Willard Mfg. Co., Appellant, vs. Union Tool Co. et al., Appellees. Order Extending Time on Appeal.

No. —. United States Circuit Court of Appeals for the Ninth Circuit. Order Under Rule 16 Enlarging Time to April 1st, 1917, to File Record Thereof and to Docket Case. Filed Jan. 11, 1917. F. D. Monckton, Clerk.

*In the United States Circuit Court of Appeals,
Ninth Judicial Circuit.*

WILSON & WILLARD MANUFACTURING
COMPANY,

Appellant,

vs.

UNION TOOL COMPANY et al.,

Appellees.

**Order Extending Time to May 1, 1917, to File
Record, etc.**

Good cause appearing therefor,

IT IS HEREBY ORDERED, that the time heretofore allowed said appellant to docket said cause and to file the record thereof with the clerk of the United States Circuit Court of Appeals for the Ninth Circuit, be and the same is hereby enlarged and extended to and including the 1st day of May, 1917.

Dated at Los Angeles, Cal., March 26, 1917.

BLEDSON,

U. S. District Judge, Southern District of California.

[Endorsed]: No. —. United States Circuit Court of Appeals, Ninth Judicial Circuit. Wilson & Willard Mfg. Co., Appellant, vs. Union Tool Co. et al., Appellees. Order Extending Time to May 1, 1917, to File Record, etc.

No. —. United States Circuit Court of Appeals for the Ninth Circuit. Order Under Rule 16 Enlarging Time to May 1st, 1917, to File Record Thereof and to Docket Case. Filed Mar. 30, 1917. F. D. Monckton, Clerk.

*In the United States Circuit Court of Appeals,
Ninth Judicial Circuit.*

WILSON & WILLARD MANUFACTURING
COMPANY,

Appellant,

vs.

UNION TOOL COMPANY et al.,

Appellees.

**Order Extending Time to May 15, 1917, to File
Record, etc.**

Good cause appearing therefor, and the condensed statement of the testimony and proceedings thereon for appeal having been agreed upon by the parties and presented to me this day for approval, pursuant to Equity Rule No. 75,—

IT IS HEREBY ORDERED, that the time heretofore allowed said appellant to docket said cause and to file the record thereof with the clerk of the United States Circuit Court of Appeals for the Ninth Circuit, be and the same is hereby enlarged and extended to and including the 15th day of May, 1917.

Dated at Los Angeles, California, April 27, 1917.

BLEDSON,

U. S. District Judge, Southern District of California.

[Endorsed]: No. ——. United States Circuit Court of Appeals, Ninth Judicial Circuit. Wilson & Willard Mfg. Co., Appellant, vs. Union Tool Co. et al., Appellees. Order Extending Time to May 15, 1917, to File Record, etc. Filed Apr. 30, 1917. F. D. Monckton, Clerk.

No. 2996. United States Circuit Court of Appeals for the Ninth Circuit. Five Orders Under Rule 16 Enlarging Time to and Including May 15, 1917, to File Record Thereof and to Docket Case. Re-filed May 4, 1917. F. D. Monckton, Clerk.

